AUTOMOTIVE INDUSTRIES

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Pacemakers Plan To Set Pace Again

As the Industry Enters Its 1937 Season New Records Are Possible

OPENING Nov. 11, the National Automobile Show will exhibit the products of an industry whose payrolls climbed from $216 million for the 12 months ending August, 1933, to $627 million for the 12 months ending with August of this year.

In the first nine months of this year its production rose 15 per cent over that for last year, and is nearly three and a half times that for the first nine months of unlamented 1932.

This, in briefest form, is a record which justifies in every syllable the phrase "automobile industry—pacemaker for American Industry" which decorates the automobile shows—and this issue of AUTOMOTIVE INDUSTRIES.

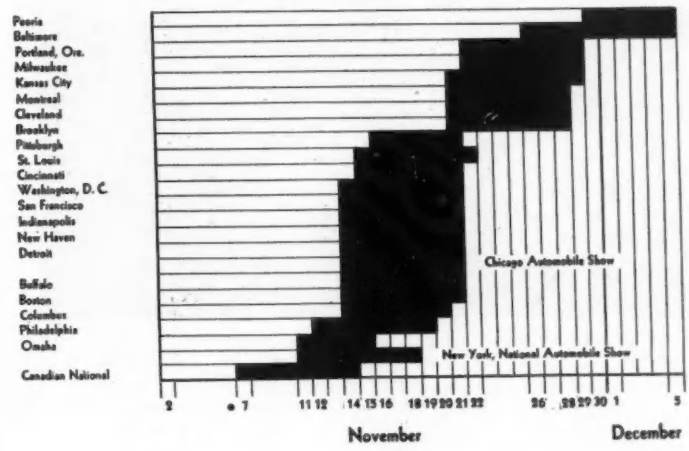
There is a trend this year which brings automobile shows all over the country in closer relation to the National Show in New York. Last year the major shows stretched out from Nov. 2 to Dec. 7, with about an equal number for each week intervening. This year the period is shortened; Nov. 2 to Dec. 5 is the span, with overwhelming favor for the Nov. 14 to 21 period.

The effect of November, as contrasted with January, announcement should be heightened by such a conjunction. Last year announcing in November is credited with having kept 150,000 persons at work in automobile and allied plants. Ordinarily they would have been laid off until the spring season.

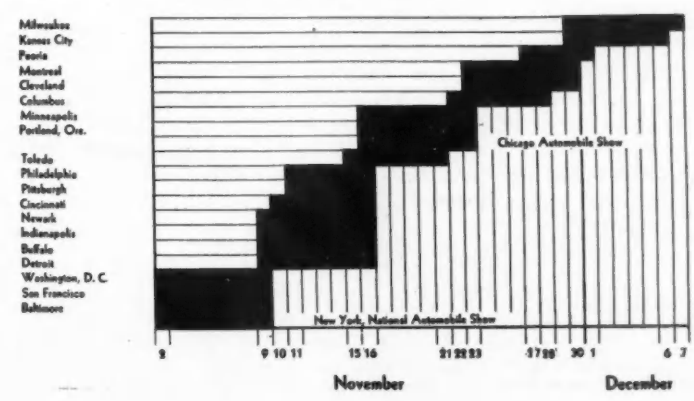
For the 1937 production season, as we have noted already in these columns, conservative students of the automobile industry expect an increase of 10 to 15 per cent numerically. The productive capacity of the industry has been increased by new plants and tooling and it seems likely that every merchandising effort will be made to make the increased capacity effective. With the lead already attained by the automobile industry as a pacemaker, we feel certain that November of 1937 will find the phrase still applicable. The next 10 per cent will be harder to get, but earnings upon it will be relatively higher.

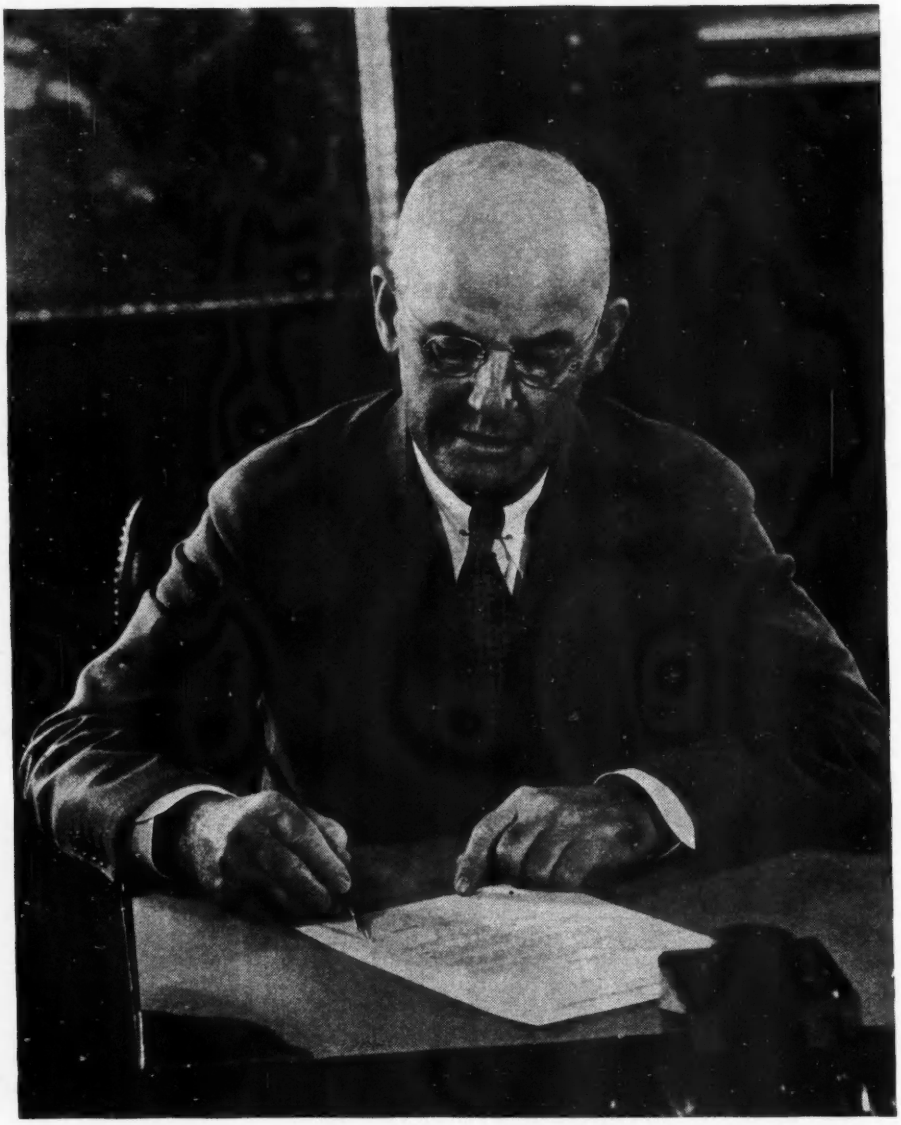
High, maintained, productivity is the keynote of the pacemakers' success. We have emphasized this in the following pages. Important also are the contributions of other industries and financial agencies in supporting the automobile industry. These, and the confidence of the public in the automobile industry, we have given additional space as they seem unusually important at this time.—H. H.

Automobile Shows—1936



Automobile Shows—1935





Photograph courtesy Packard Motor Car Co.

Alvan Macauley: *Master Leader*

For more than eight years Packard's president has been honored with the presidency of the Automobile Manufacturers Association. In this position he is known throughout industry as the delegated leader of an industry which itself has (at least twice) provided the stimulus for general recovery. His the phrase: "The automobile industry—pacemaker of recovery," which is the theme of the National Automobile Show and of this issue of AUTOMOTIVE INDUSTRIES. His the honor for more than one man's share of the tangible accomplishment which justifies the phrase.

PACKARD MOTOR CAR COMPANY

DETROIT, MICHIGAN

ALVAN MACAULEY
PRESIDENT

Mr. Julian Chase, Directing Editor
AUTOMOTIVE INDUSTRIES
Chestnut and 56th Streets
Philadelphia, Pa.

Dear Mr. Chase:

In considering the highly important part the Automobile Industry has played in bringing about recovery, I think a point to be stressed is not only the depth but the breadth of the industry's influence on the economic well-being of the American people.

The industry made large cash expenditures during the depression to improve its product. It was in a position to take the initiative as soon as a change for the better occurred. In this it bespoke its confidence in the ability of the American people to throw off the shackles that had bound them to the depression. That reliance was amply rewarded. Behind the accomplishments of the automobile business in its role of pacemaker of American industry is, in turn, the public's expression of confidence in the industry itself.

Buying of automobiles brought great sums to the motor car trade, and much of this money went out into other industries for the purchase of materials. There was an immediate acceleration of activity in the steel, rubber, machine tool and many other businesses. Increased use of automobiles stimulated local trade far and wide. The spending cycle kept expanding as these activities brought greater employment, increased wages and other benefits.

It is customary to think of the Automobile Industry as one largely confined to Detroit—or Michigan. In reality, directly and indirectly, it is a national enterprise penetrating deeply into the economic life of the people of every state and every single community.

Very truly yours,

Alvan Macauley

Washington
Transportation Building

Cable Address
Automakers

Detroit
General Motors Building

AUTOMOBILE MANUFACTURERS ASSOCIATION

366 MADISON AVENUE AT 46TH STREET, NEW YORK

October 27th
1936

Mr. Herbert Hosking
Automotive Industries
Philadelphia, Pa.

Dear Mr. Hosking:

I think that your question "What About Business for 1937?" has already been answered by the automobile industry itself.

Today, Detroit is geared for the largest volume of business in its history, because in 1937, the American public will be offered the greatest automobile values in the history of the industry.

The motor car manufacturers have evidenced their faith in their products and the market for them next year by large expenditures for new equipment, new tools and dies.

And if the statisticians are right — and I believe they are — we will see more than 4,000,000 cars produced and sold in 1937.

Sincerely yours,

Byron C. Foy
Secretary

Byron C. Foy

Photograph courtesy Chrysler Corp.

Byron C. Foy: *Master Salesman*

The dynamic president of the DeSoto Motor Corp. is also secretary of the Automobile Manufacturers Association and a member of the latter's show committee. With his own organization poised to try for its biggest year he tells what he expects of that year on the preceding page.

Photograph by Brown Bros. for AUTOMOTIVE INDUSTRIES

Alfred Reeves: *Master Showman*

To his manifold duties as vice-president and general manager of the Automobile Manufacturers Association, Mr. Reeves adds the important responsibility of carrying on the National Automobile Show in New York. His views on the future of the November shows are presented on the following page.

Washington
Transportation Building

Cable Address
Automakers

AUTOMOBILE MANUFACTURERS ASSOCIATION

Detroit
General Motors Building

366 MADISON AVENUE AT 46TH STREET, NEW YORK

Herbert Hosking, Editor,
AUTOMOTIVE INDUSTRIES,
56th & Chestnut Streets,
Philadelphia, Pa.

Dear Mr. Hosking:

With "The Automobile Industry - Pacemaker for American Industry" as its theme, the National Automobile Show will open in Grand Central Palace, New York, on November eleventh, officially inaugurating another new automotive year.

Readers of AUTOMOTIVE INDUSTRIES will share with other members of the automobile industry the sense of satisfaction which is derived from this reminder of the role which they have been privileged to play in leading business recovery.

The Show, itself, will definitely establish the success of the industry's stabilization of employment program. The introduction of new models in the Fall - a major feature of this program - may be expected to continue as a permanent policy of the industry.

While the show theme gives recognition to the contributions which the automobile industry has already made to the development of higher standards of living, it expresses at the same time the industry's pledge for continued public service.

In this larger sense, "The Automobile Industry - Pacemaker for American Industry" holds the promise of expanding opportunities for those whose efforts have given it its present significance.

Sincerely yours,

Alfred Reeves

Vice President and General Manager

Millions—

DESPITE the vast expenditures made by automotive manufacturers last year in preparation for the 1936 season, an even greater investment was made this year, and in fact the program still is under way, in anticipation of a possible 5,000,000 car year in 1937.

To cite but a few outstanding examples of capital investment for the 1937 season, we may mention the following: Buick, $14,000,000 for foundry improvements, new factory buildings and general modernization of machine shop facilities; Oldsmobile, $6,500,000 for the new Six and Eight; Pontiac, $6,000,000 of which $3,000,000 went into the new axle plant and about $500,000 for the foundry; Fisher Body, $25,000,000 in tooling and equipment for the new all-steel bodies; Packard, $6,000,000 in retooling for the new Six and 120; DeSoto, over $5,000,000 for a new manufacturing plant.

The modernization program of the automotive industry this year is distinguished by two major characteristics—first, a positive tendency to take advantage of the latest developments offered by the machine tool industry; second, to combine the improved methods with increased productivity which is demanded by the anticipated increase in sales for 1937. Depending upon circumstances, the latter condition has been met either by equipment capable of greater productivity, inherently, or by the installation of additional machines.

For the first time in many years, big changes have been made in every department of the manufacturing plant. Larger and more roomy all-steel bodies required a tremendous program of die building and some additional press shop equipment. This was carried out in practically every plant—all Fisher Body divisions, at Hudson, at Seaman Body, and elsewhere. Machine shops everywhere in the automobile plants came in for major installations of new equipment. And, perhaps, the biggest activity has been centered upon foundry improvements as in the case of Buick and Pontiac.

Let it be emphasized at this point that in all the activity briefly summarized above, there has been a most conscious effort to provide improved worker comfort, especially in places where the customary working conditions made such changes desirable. Foundries have made the largest contributions to this end by the introduction of mechanized equipment and conveyors which relieve the workers of the back-breaking manual labor usually associated with foundry operations. But more of this later.

In all of the plant changes made during this year, there has been a most conscious effort to provide improved worker comfort.

New equipment at the Buick, Oldsmobile, Pontiac, Packard, DeSoto, and Fisher Body plants alone accounts for a capital investment of $62,500,000.

Recent developments prove that the new art of surface broaching must be reckoned as one of the most important contributions to machine shop practice.

Another widely used worker comfort feature is the general introduction of new types of paint spray booths. The most advanced types as may be exemplified by the installations at Plymouth, DeSoto, Pontiac, Lincoln, and other plants, have a positive circulation of fresh air, either under pressure or by suction and in addition have water sheets which wash away all overspray. In some cases, as in the finishing of bodies and large sheet metal surfaces, the entire department housing the spray booths is in an air-conditioned enclosure, so that nothing but cleaned and washed air is permitted to enter. These installations are changing the picture of working conditions in a revolutionary manner since it is possible for people to work in these modern paint shops without the aid of cumbersome protective devices such as masks and nose guards.

Just about five years ago we discussed in AUTOMOTIVE INDUSTRIES the potentialities in advance planning of engineering design cooperatively with the production department. This year we note the fruition of a comprehensive program of this nature. It applies particularly to body production due to the great investment in dies required for all-steel construction. Without going into details, suffice it to say that in many important quarters the same body is used interchangeably on at least several different chassis models. Packard is proud of the fact that the same body is used on both the new Six and the 120.

But interchangeability is carried still further in body production. By the use of dies with removable sections, it is possible to utilize the same dies for different body styles and it is possible to use even the same doors or at least the same door panel dies for different body styles.

Machine shop practice has made even greater progress due to closer cooperation between engineering and manufacturing departments. This is evident in many ways. In general, it has been found possible to achieve a large degree of interchangeability in many functional parts of the car such as knee-action units, mounting brackets, engine details, etc. In particular, Buick, for example, has developed a new type of muffler which is used interchangeably on all chassis models; Packard has so designed the new Six that nearly all chassis units are the same as on the 120. In addition, the cylinder blocks on the Packard Six and 120 both are finished on the same equipment with the use of special fixtures. Cadillac has developed a new transmission, much lighter than heretofore, which is used interchangeably on all chassis models. This phase of the discussion could be carried on almost indefinitely if it were to cover the industry in detail.

Perhaps the most important machine shop program now completed and in

for Better Cars and Working Conditions

By Joseph Geschelin

operation is the new Pontiac axle plant which was built at a cost of about $3,000,000. This comprises an installation of 315 new machines including 103 new Gleason ring gear cutters, gear lappers, gear generators, and gear matchers. Here will be found, too, some novel special machines built by Ex-Cell-O including several three-way boring machines; a battery of Bullard Mult-Au-Matics and Contin-U-Matics, and a variety of other interesting machines, featuring also a huge Electric Furnace Co. unit for heat treating rear axle shafts. This unit has a neutral atmosphere for producing a clean, scale-free finish.

It will interest readers of AUTOMOTIVE INDUSTRIES to know that the complete modernization program at Pontiac, entailing a capital expenditure of $6,000,000, will be described in detail in AUTOMOTIVE INDUSTRIES, Dec. 5, 1936, as a part of the special series on the plants of the industry.

A detailed analysis of the new equipment program of the industry, which could not be practical at this time, would show the installation of machinery produced by prominent organizations in the machine tool industry, some of which was featured last year at the National Machine Tool Show and some items which are a product of development since the show.

In mass production, we note the extension of use of the Bullard method as exemplified in the Contin-U-Matic and Mult-Au-Matic; a growing use of the continuous method for drilling and tapping as offered by the Davis & Thompson Roto-Matic; the ever-widening use of centerless grinding for larger work having more complex forms. Examples of the latter are—the grinding of pistons, grinding of Pontiac axle shafts, grinding of igniter body bearings as at Auto-Lite, etc.

Recent developments prove that the new art of surface broaching was not destined to be a meteor-like flash, but must be reckoned as one of the most important contributions to machine shop practice. It has fulfilled its original promise of supplanting the time-honored milling machine operations on certain specific jobs and is gradually becoming the universal method for cutting crankcase bearing locks as well as large areas. Pontiac has just installed a horizontal Oilgear broach having a stroke of 120 in., which not only cuts the bearing locks, but forms the half-bearing as well. Packard has two huge Cincinnati horizontal broaching machines handling both the Six and 120 blocks—one takes the top surface in one pass; the other finishes the bearing locks and pan rail in one pass. These machines have a stroke of 177 in. and operate at a speed of 35 f.p.m. Production is at the rate of one a minute for the top and 1.37 per minute on the pan rail.

These are examples of the more spectacular operations. The method is spreading to many other points, and applications will be found of the new surface broaches made by Colonial, Foote-Burt, American Broach, and others.

Gleason gear cutters, naturally, are universally used wherever hypoid gears are cut. But the gear cutting art particularly for transmissions has made revolutionary progress in the past few years. Prominent in this development will be found such names as Michigan Tool, National Broach, Fellows, Barber-Colman, and others, including the new gear lapper made by Hutto.

Turn-milling is another new art, incorporating the climb-milling technique, which seems destined to make great progress in automotive machine shop practice. The first machine of this type, shown at the Machine Tool Show, has been in operation at Spicer for many months and has justified its early claims. Another installation is going in at Pontiac.

Welding is, of course, so intimately associated with body manufacture that it has become an indispensable art. For

(Turn to page 645, please)

Present

By Milan V. Ayres*

AYRES and analysis are inseparable in the minds of those who have business with the National Association of Sales Finance Companies. Financing and big sales volume are inseparable in the automobile industry. So, in an issue of AUTOMOTIVE INDUSTRIES dedicated to the pacemakers of recovery, we present with pleasure an article by Mr. Ayres on one of the chief factors which makes pacemaking possible.—THE EDITOR.

IN automobile selling, what the public sees is the retail transaction. From this, the idea has grown that retail car financing completes the entire picture. The manufacturer, whose business is with the dealer, knows otherwise; while the franchised dealer, whose business is with both the manufacturer and the car buyer, has his interests centered on correlating his deliveries from the factory to his show room so as to get the quickest possible turnover.

As between retail and wholesale financing, the latter is greater than the former both in point of numbers of vehicle units and the total dollars involved.

The automobile industry knows that the public does not know about automobile financing. It knows that not all cars sold at retail are time payment or installment transactions.

The public's opinion of retail automobile financing is that practically all automobiles are sold through the media of installment financing. The automobile industry knows this is not so. Figures for the year 1935 show that only 58 per cent of all new registrations in the United States were installment transactions. Of this number, only 41 per cent were handled by finance companies. As to the remaining 17 per cent, the dealer either kept the paper himself, or it was disposed of to individuals who sought it as investment, or it was discounted by dealers at their business banks. Forty-two per cent of new car sales were either cash transactions or the sale was handled in such ways that it does not show up as installment selling. On the other hand, almost every new car that left the factory was a wholesale financed transaction.

Figures showing the per cent of new cars sold on the installment plan, with those financed at retail by constituted finance companies, on the basis of a comparison with new car registrations, are shown in the table on the next page.

Considering now retail financing, it is safe to say that if there were no plan for financing installment sales of cars —despite the fact that they only affect somewhat more than half the total number of sales—with this year's percentage at several points higher than for any year since 1932—the automobile industry would only be doing about 30 per cent of its present volume. Not only is this so, but prices would be higher, and quality lower, because the efficiency resulting from mass production would not have reached its present high plane.

Retail financing is the life and blood of the automobile industry, and while installment selling may never again reach as high a point as 75 per cent, each percentage point that it does gain means thousands of new cars coming off the assembly lines.

Not only are sales of new cars directly increased by the installment selling plan, but they are also accelerated by the installment selling of used cars, for if used cars were not thus provided with a market they could not be taken in trade on new cars at anything like their present prices, and new car sales would be greatly retarded. Although there are no figures available as to the used car market, in 1935 about 63 per cent of used cars were sold on installment.

The history of installment financing for retail sales goes back to 1912. There is some dispute as to who was actually the first to foresee its possibilities, but it appears that Arthur J. Morris, founder of the Morris Plan Bank, and a firm in California, went into it at about the same time. It was shortly after 1912 that the National

* Secretary and Analyst, National Association of Sales Finance Companies.

Volume Achieved by Financing

Ratio of Cars Financed to Registrations

	New Motor Vehicles Registered	Number Fin. Co. Financed	Per Cent Fin. Co. Financed	Per Cent Financed by other agencies than by Fin. Cos.	Total Per Cent Sold on Installments
1932	1,276.7*	555.0*	43.4	11.2	54.6
1933	1,757.7	760.0	43.2	13.6	56.8
1934	2,292.4	1,064.1	46.4	8.0	54.4
1935	3,254.6	1,333.6	41.0	17.0	58.0
8 mos., 1936	2,916.9	1,382.0	47.3	...	...

* Denotes thousands of vehicles.

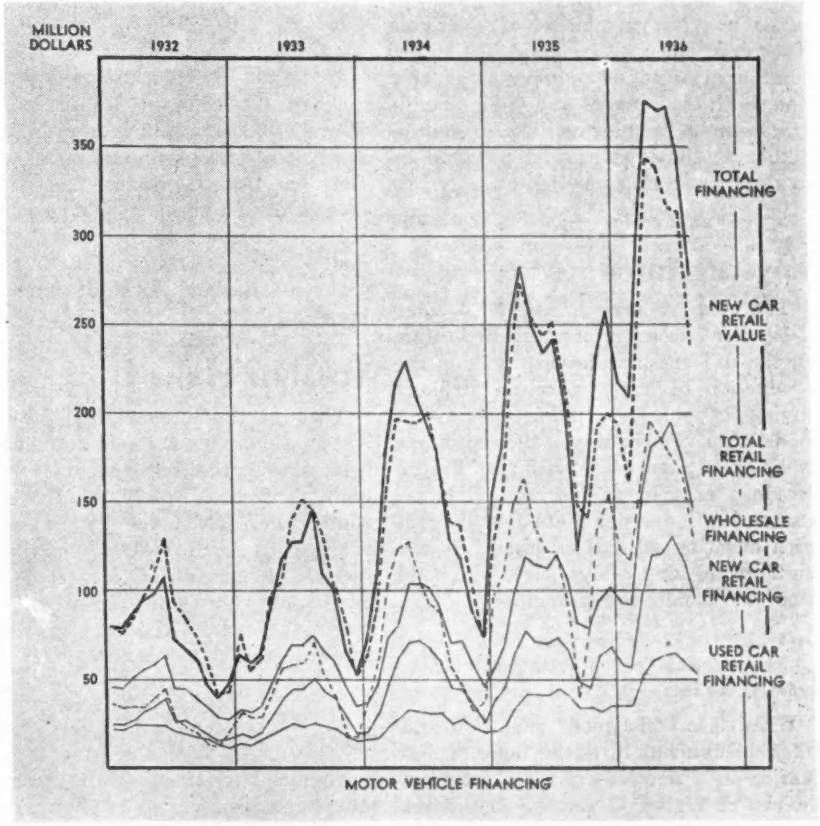
Bond & Investment Company, a banking house specializing in buying up accounts receivable from business firms, began discounting paper from automobile dealers. Since that time, the growth of the automobile industry has been paralleled by the growth of automobile retail installment financing. One of the earliest attempts to bring order and uniformity into the car finance business occurred in 1919 when General Motors Corporation organized General Motors Acceptance Corp. The chief function of G.M.A.C. at the start was to facilitate wholesale financing between the corporation's several companies and their dealers. It still serves this purpose, but the retail end of the business has always been regarded as G.M.A.C.'s most important function. Subsequently the Ford Motor Company organized the Universal Credit Company, which has been transferred to C.I.T. Corporation, and handles nearly all the Ford paper; and there is the tie-in which Chrysler Corporation has with Commercial Credit Corporation.

Figures relating to automobile retail financing were meagre prior to 1928, which year marks the beginning of the government's monthly compilations of automobile finance statistics. For comparisons, however, we are presenting only the figures from 1932 to date. This is not because the figures for the four years from 1928 to 1932 are any the less reliable, but 1932 marks the upturning from the low point of the depression. It also establishes the time when the new trend in streamlined design came into being.

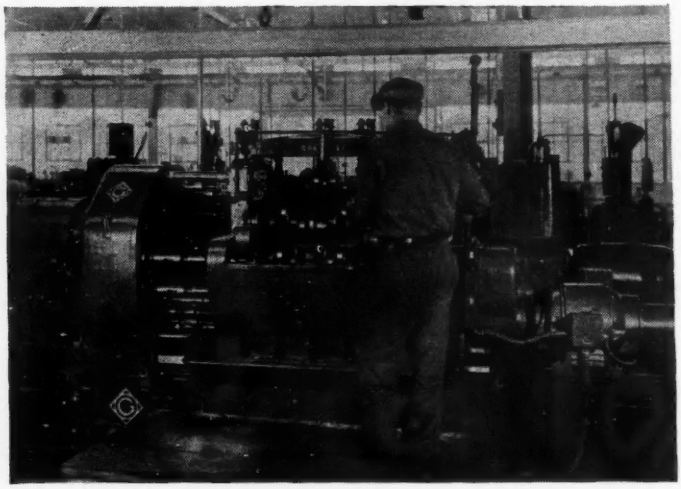
The service of the finance companies to the automobile industry is in three fields—retail new car financing, retail used car financing, and wholesale financing. The curves in the diagram show how each of these has fluctuated and grown from the beginning of 1932 through August, 1936. The magnitude of wholesale financing is particularly noticeable.

Beginning with 1932, wholesale financing has exceeded the total of new and used car retail financing in nearly every month, and for each year as a whole. The two highest curves in the diagram afford a comparison between the dollar value of total financing, for both retail and wholesale, and the retail sales volume of all new motor vehicles sold in the United States. It is inter-

(*Turn to page 633, please*)



Here is shown the relation between the total volume of automobile financing and its constituent forms.



Production Lines

A large amount of new machinery has been installed in the Chrysler plant. The changes involved an expenditure of several million dollars. The Greenlee machine shown in the illustration is a special two-way, horizontal six-station index drilling and tapping machine which operates on both ends of the crankshaft simultaneously.

What Fuels

There is an investigation under way to determine to what extent it might be practical to standardize on fuel requirements for heavy-duty gasoline engines. Certain observers have told us that combustion chamber design evidently is being tailored for low grade fuels on the theory that many truck operators wish to burn cheaper fuels; also because of the variability of available low grade fuels. We should like to get some expression of opinion along this line. Both the refiners and engine builders seem to be most willing to get together so that the next step would be to start something moving.

Toys to Autos

The current issue of the N. J. Zinc *Alloy Pot* has an interesting little item on the use of zinc die castings for the production of a toy gasoline airplane engine capable of lifting a six-foot model ship. For example, the crankcase is die-cast in one piece with tiny bronze bearings cast in as inserts. Exhaust arm and cylinder side plate also are cast with exacting miniature detail. So the high grade zinc alloys serve the field from automobile to toy engines.

Good Oil

When is oil in "good" condition and what to do about it, is the topic of discussion in a new 12-page booklet from the pen of Walter C. Bauer. The object of the booklet is to point out the requirements of engine lubrication, particularly for heavy duty service, noting some of the important tests for quality of new and used oil. The value of the presentation lies in the description of the results of tests comparing various commonly-used oil filters. "Oil Filtration Manual" is the title of this book, published in the interest of the Briggs Clarifier. How the Briggs filter stacks up in fleet operation also is graphically described. Ask us for a copy.

Vol. 1.—No. 1.

The first issue—Vol. 1, No. 1—of *The Foundation*, official organ of the newly organized Engineering Society of Detroit, is off the press. It carries a message from the new president, J. H. Hunt, who needs no introduction. Boss Kettering's picture graces the front cover as speaker at the opening meeting.

16 MM. Film

Through the International Standards Association, a new world standard has been established for the interchangeability of the widely used 16 mm. sound film. Read the article on this subject by S. K. Wolf in the October *Industrial Standardization*. It assumes particular significance what with the increasing use of the 16 mm. film by the automotive industry.

Safety Handles

No doubt exists that the accent in motor car design is on safety. Among the tremendous trifles that enter the picture are the exterior door handles, and this year they invariably curve inward to the door panel so as to avoid hooking or jabbing the pedestrian. This development makes us wonder whether or not the next step will be the adoption of flush-type door handles which leave nothing at all to protrude on the sides. We don't want to name names but it's an open secret that at least one large parts maker has something that will just fill the bill.

Good Forgings

R. E. W. Harrison, vice-president, Chambersburg Engineering Co., in a recent talk posed the question—"What is good drop forging practice?" As an answer he proposed the following definition:

The production of forgings which are true to die and with a minimum of flash.

The production of forgings with top and bottom halves matched in near perfect alignment.

The production of forgings with grain flow so disposed that physical characteristics are the maximum obtainable with the metal used.

The production of forgings without cold shuts, laps, or seams in the minimum of time.

Gasoline Specs

October *Industrial Standardization* has a timely article on gasoline specifications by R. E. Hess of the ASTM. It touches upon octane number, volatility, vapor pressure, and gum content.

—J. G.

MANUFACTURING MANAGEMENT METALLURGY

By A. N. Benson *

Dealers —

have improved their profit position during the last year. Geared to take full advantage of fall demand.

WHEN the new models were introduced last fall, speculation was rife among automobile dealers concerning the wisdom of this change and its effect upon dealer operation. The first year of operation under this innovation is now history. It is safe to say that a majority of dealers are agreed that the change from January to November was a good move even though it brought many difficult situations which dealers had to overcome. Dealers now are preparing to start another year under similar conditions. With the experience of last year to guide them, it should be possible to avoid many of the costly mistakes which handicapped so many of them last winter.

Introduction of new models in November has made it necessary for automobile dealers to completely readjust their selling programs. Last year, many dealers were unprepared for the unprecedented demand for the new motor vehicles during November, December and January. This fall will find most dealers geared to take full advantage of the demand that will follow the announcement and showing of the 1937 models.

The general improvement recorded in practically all lines of business during the current year has been especially apparent among automobile dealers according to information received by the National Automobile Dealers Association. This important trade group which is second only to the food group in the United States in dollar volume has established records in all departments during the first nine months of the current year which were exceeded only in the boom year of 1929.

Based on reports of 526 representative automobile dealers, all makes, all size operations, for the first nine months of 1936 compared with the same period of 1935 it would appear that, generally speaking, dealers are entering the new selling season in very good shape. Stocks of current models are depleted in most lines. On Sept. 30 these dealers averaged *only* eleven new cars on hand. While used car inventories are approximately 15 per cent higher compared with the same period last year, this increase is offset by an increase of 34.5 per cent in used car sales recorded by these representative dealers for the first nine months. The annual clean up of current models this year has been accomplished in an orderly manner and most dealers have been able to close out their stocks without too much sacrifice of gross profit.

A. N. Benson

These reporting dealers show an operating profit per cent of total sales of 2.73 per cent compared with 1.78 per cent for the same period of 1935. How much of this increased profit was retained during the remainder of the year is yet to be seen. In view of the better position in which dealers find themselves, if they can wind up the year on a basis comparable to 1935, they should show a healthy increase in earnings for the year.

It cannot be overlooked that the critical period of operations for most dealers is the last three months of the year. Too often in the past the operating profits earned during the selling season have been largely diminished or entirely dissipated due to unsound practices followed in these closing months of the year. The final profit picture will depend greatly upon the manner in which dealers exercise good management and also to a large extent upon the degree of cooperation exercised by manufacturers with their dealer organizations in developing the sale of the new models. If the market is forced to any extent, dealers perforce will be compelled to resort to "wild trading" practice with the result that used car stocks, both as to inventories and value, will assume serious proportions as they did a year ago. Such a condition is bound to result in heavy losses and materially reduce the ultimate net earnings of thousands of dealers.

Altogether the situation in this industry is one which warrants optimism. Everything indicates that we are entering a period of profitable business operation for those dealers who are capable of taking advantage of the opportunities which exist. From all indications, there will be a ready market for millions of new and used motor vehicles during the coming year.

In the field of intra-industry problems automobile dealers as a group

(*Turn to page 662, please*)

*General Manager National Automobile Dealers Association.

Over Six Million

STEEL producers have benefited impressively from the automobile manufacturing industry's activity as pace-maker of recovery. Last year's automotive consumption of finished steel, in round figures of 6,000,000 gross tons, denoted an increase of 50 per cent over the preceding year's purchases of 4,000,000 gross tons. While anything like repetition of so spectacular an increase seems out of the question, statistical indices point to a further gain this year, proportionate to whatever increase 1936 automobile production will record. Credited last year with having consumed 25 per cent of the entire finished steel production, the automobile manufacturing industry is assured maintenance of first place among steel consumers. While showing some improvement, steel demand for building and railroad purchases have not yet recovered to a point where they even remotely approach automotive takings. And if dollars, instead of tons, served as yardstick, the size of the automobile manufacturing industry's steel bill would top that of other steel consuming industries by an even more impressive margin.

Automotive orders served to prime the pump of the steel market at a time when other steel consumers were in no position to extend support to it, and for some time after that automotive consumers quite frequently had the market to themselves. That at such times no pressure was brought to bear on prices was in a large measure due to the good sense of buyers who were more interested in speeding up the wheels of business than in driving a sharp bargain for price or favor.

On the other hand, while newspaper headlines may have created the impression here and there that steel prices were sharply advanced in the last year or two, the actual record discloses nothing more than moderate upward adjustments that were necessary to lift the steel industry out of the red. Certain it is that such an upswing in steel demand, as was brought about through the leadership of the automobile manufacturing industry, would in "the good old days" of speculative steel markets have been the signal for one price advance after another.

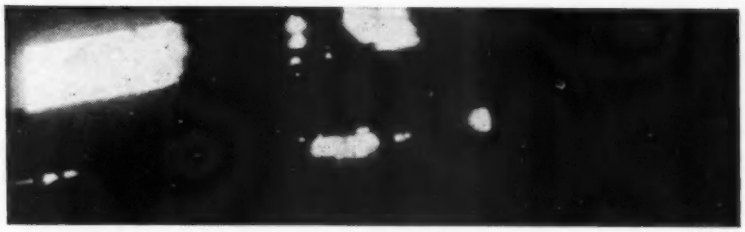
It may be that the program of wage adjustments, recently announced by the leading steel producer, will entail further reexamination of the adequacy of selling prices. In this, however, the steel industry may be depended upon not to lose sight of the implications of recent price reductions in the automobile field. Amicable solution of the price problem, growing out of the need of giving labor its rightful share in the benefits of recovery, is all the more certain as automobile manufacturers and steel producers see eye to eye in their relations with labor. A sound profit margin, assuring equitable returns on the capital investment, will be much more readily conceded by steel buyers than one predicated on what "the traffic will bear" in times of brisk demand.

The mind of the steel industry of today is no more like that of its earlier days than is one of its automatic continuous rolling mills like an old hand-unit. For years even its most progressive leaders looked upon price without giving much thought to its effect on the salability of the finished article into which the steel went. Wire nails, fence wire, galvanized roofing and other consumers' goods, marketed through wholesalers and jobbers, hardly afforded what might be called consumer-contact. The ultimate buyer of steel, as assembled into a piece of machinery, was a vague personality to the steel producer. The automobile has changed all that.

Developments in the last few years have made the steel producer keenly aware of the fact that the rate of his mill's operations from week to week is largely made by the automobile dealers of the country and their salesmen. It is as much to his interest to understand the car buyer's mind and pocketbook as it is to theirs. Walking hand in hand with the automobile manufacturer, the steel producer has become consumer-minded and has learned that the price of steel, affecting as it does the sales price of the automobile, must be such as to help and not hinder car sales.

This transformation in the viewpoint of the steel industry implies eventually the discarding of one of its for many years cherished traditions, that of rising demand justifying higher prices while resigned to their crumbling away when buying appetite lags. Had the automobile manufacturing industry conferred no other service upon steel producers than to point out to them

THE price per pound of automobiles is an important gage of progress in automotive construction and price per pound begins in the metallurgical laboratories of the steel mills. Because of the close relationship between motor vehicles and steel, AUTOMOTIVE INDUSTRIES asked its contributing editor on metals markets to review the relationship as it has existed during the "pacemaking period." Here is the story, and it turned out to be more interesting than even we expected.—THE EDITOR.



Tons of Steel for 1937 Cars

Photograph by Don Blanchard

By William Crawford Hirsch

by example the wisdom of a price policy based on a program of fostering mass consumption without penalizing those who buy at the peak of the demand, they would be deeply in the formers' debt.

Base prices do not tell the whole story of the relations between automobile manufacturers and their steel suppliers. There are extras for special mechanical and chemical properties. Minor readjustments of these have met with no criticism on the part of buyers. Were it not for the excellent teamwork of automotive engineers and steel plant metallurgists, many of the long list of fine alloy steels could not have been produced at prices within the range of commercial usefulness. It is one thing to draw up specifications for the properties that an alloy steel should possess in order to perform satisfactorily in a given application. It is quite another to work out a metallurgical formula that will yield a steel having these properties and yield it at a price that will not unduly enhance the cost of the automotive unit for which it is intended. When but a minimum of benefit would be derived from excessive cost, a compromise is in order and in such efforts the technological organizations of the automotive and steel industries have been drawn closer and closer together. This has not been without a harmonizing influence on the relations of automotive plants' purchasing agents and steel company sales managers.

Not so long ago, there would creep periodically into steel market reports adverse comments on sheet rejections by over-fastidious buyers. These complaints have greatly diminished in number. The reason probably is to be found in more uniform quality output and better inspection at sheet mills as well as a more reasonable attitude on the part of buyers, there being a distinction now made between insistence on receiving sheets of the quality agreed upon and unnecessarily finding fault.

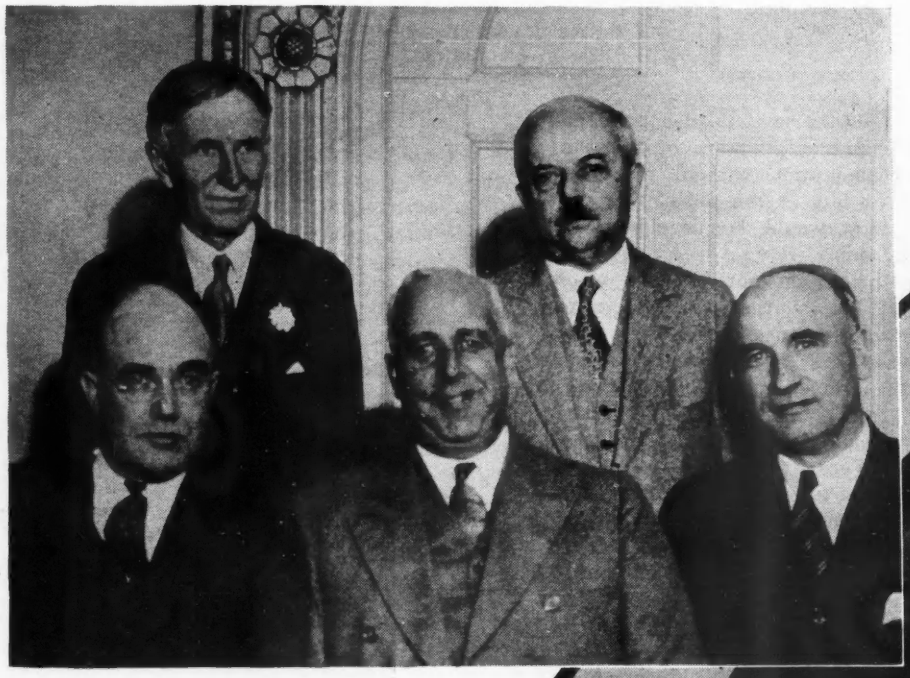
In the past two years there occurred, as there always will, periods when no small part of the service rendered by the steel industry to automobile manufacturers and parts makers consisted of special accommodation in the expediting of shipments. Rolling mill schedules and those of their finishing departments must be systematically laid out well in advance, so as to avoid expensive time losses. Quite frequently, however, the exigencies of a loyal customer's production program call for a deviation from the set course, and many instances of such accommodation service, both in the production and

(*Turn to page 647, please*)

Tire Makers Keep Pace with

By "Latex"

SAFETY, economy and comfort have been the rubber and tire industry's three major contributions to motoring,—Safety through the constant improvement in tire construction and in scientific tread design and through the making of tires more durable and serviceable; Economy through the ability of the industry to progressively lower the cost of tires (while making them better), to the point where the motorist today spends one-fourth as much for tires as he did before the war, and get 10 times the service out of them; Comfort through the development of the low-air pressure balloon tire with its greater cushioning and through the development of rubber bumpers, rubber shock absorbers, and rubber springs for mounting automobile engines to minimize wear and tear and vibration and make motoring more pleasant.



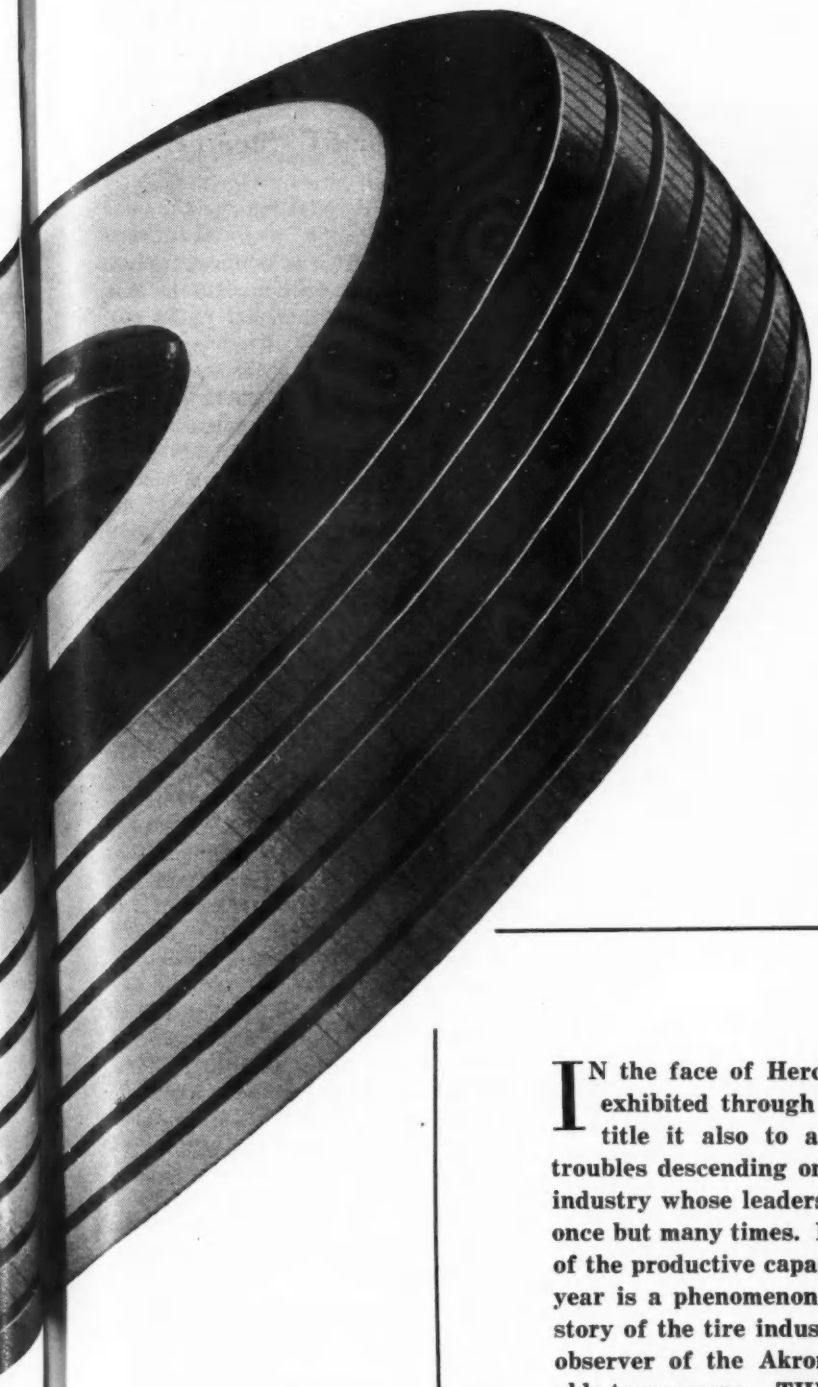
This is believed to be the only picture ever taken of Akron's "Big 5" of the tire industry in one group. Top left, Harvey S. Firestone; right, Frank A. Seiberling. Below left to right, James D. Tew; Paul W. Litchfield and William O'Neil

As if these laurels were not enough the tire industry rightfully lays claim to having given a greater stimulus to the automobile industry than any other industry. The tire industry's steady and commendable progress in the art of tire building has rendered automobile transportation both more economical and more comfortable—for where would the automobile or the motor truck or the bus be today without rubber?

And what of the future of these two gigantic industries that are so mutually interdependent? They'll go on together,

Automobile's Progress

continuing to develop better cars and better tires at lower cost, continuing to accelerate economic recovery, and continuing to be the economic backbone of the nation and of the world. Alternately they will lead in scientific advancement. Together they will give stimulus to America's newest and perhaps most promising industry and automotive development — the automobile house trailer—for every trailer needs a chassis, wheels and rubber tires.



Digressing for the moment from the manufacturing picture, there looms for both the automobile and the tire industries, marketing revolutions that may have a deep seated effect upon the economic affairs of the nation, and that may mean revolutionary merchandising procedures and programs.

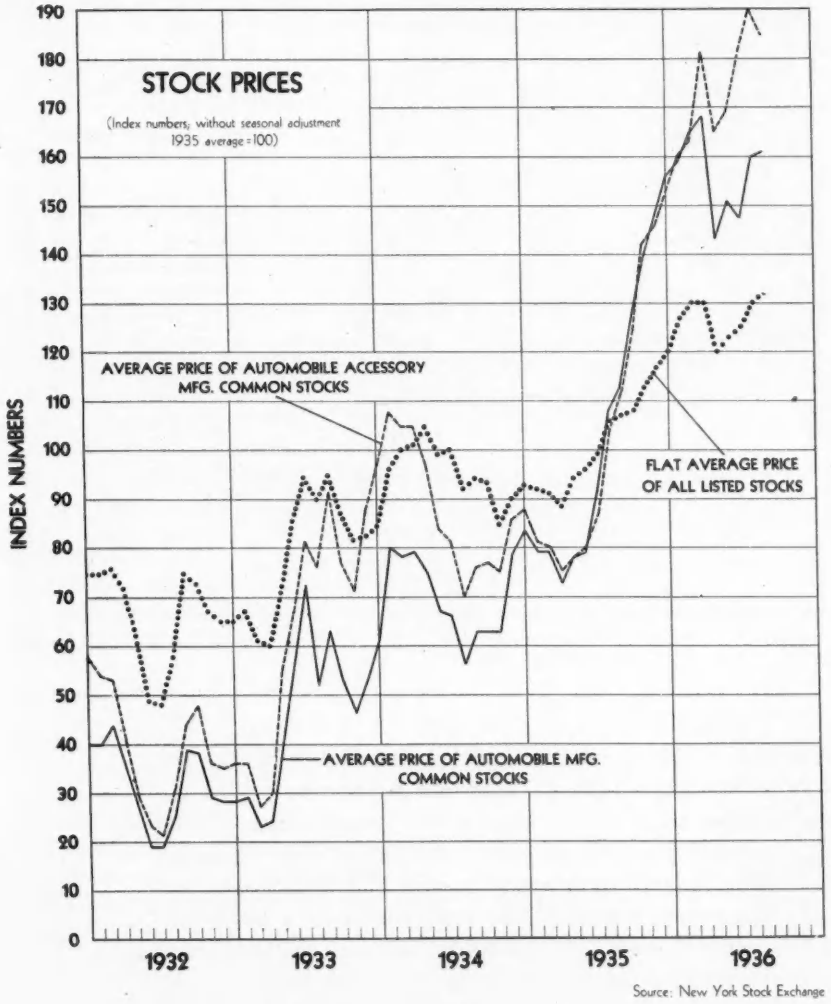
First—there's the keg of dynamite the tire industry is sitting upon with respect to labor—a keg of dynamite that is apt to explode at any moment with terrific detonation. Labor trouble has been smoldering in Akron—heart of the tire industry—for nearly a year, with frequent outcroppings of disorder and violence. Sitdown strikes by the dozens have stopped production in Akron's leviathan tire plants which annually supply nearly three-fourths of all original equipment tires consumed by automobile manufacturers. The automobile industry must have tires when it needs them. It must have basic sources of supply entirely free from the hazard of estoppage of production or blockade of shipments. The Akron labor situation is the most vexa-

(Turn to page 642, please)

IN the face of Herculean difficulties, the tire industry has exhibited through 1936 a vigor and enterprise which entitle it also to a place among the pacemakers. Labor troubles descending on Akron like a dreaded plague found an industry whose leaders were ready to rise and fight again, not once but many times. Effective decentralization of a large part of the productive capacity of a gigantic industry in less than a year is a phenomenon of significant proportions. Here is the story of the tire industry as it is today, written by a seasoned observer of the Akron scene, who, remaining anonymous, is able to say more.—THE EDITOR.

Public Confidence

Maintained the automotive industry through lean years and on the first post-crash upturn its stocks showed greater vitality than others.



Source: New York Stock Exchange

By James U. Steinfirst*

THROUGH the complex picture of human reactions and the maze of shifting financial paths over the past four years, it is possible to trace a deep-seated appreciation on the part of the general public for the achievements of the automotive industry and a desire to participate in its progress. The trend has been accelerated by the continuous efforts of the industry to acquaint the people with its progress.

The record demonstrates no infallible judgment so far as investment in the automobile industry is concerned, but it shows that the the public was fully cognizant of the profits possibilities in the industry, and that it took advantage of them. It shows further that the public did not forget the past highly seasonal nature of the business when buying and selling automobile stocks. It proves though, that America did notice the successful efforts of the motor manufacturers to bring out ever more salable products, and to advertise them wholeheartedly even in hard times. The public saw that those efforts were rewarded with increasing sales volume and improved profits, and it acted accordingly.

Public confidence in the automobile industry could not but have been bolstered by the financial stability of the group of companies as a whole. Depression-born failures were very few in either automobile or accessory lines. Two major automobile companies have been reorganized—two others may yet emerge from receivership. One manufacturer borrowed heavily at the banks, but since then has reestablished a profitable basis of operations. A few of the supply companies got into financial difficulties, but the mortality was negligible.

*Financial News Department, New York *Journal of Commerce.*

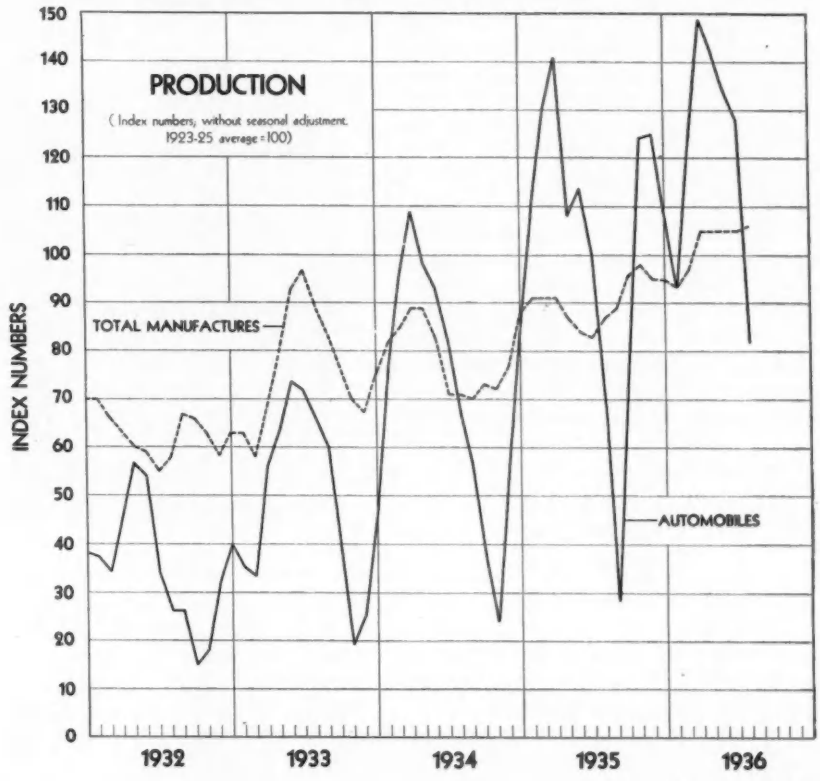
On the other hand, the ability of most major factors in the field to maintain unimpaired their financial positions, and even to pay some dividends out of intermittent or prior years' profits, was an unpaid advertisement of strength.

One of the biggest concerns was able, at the first blush of recovery, to finance through bank loans the elimination of its entire funded debt in a transaction running to many millions of dollars. The three leading finance companies similarly, have refunded huge amounts of notes and other securities at very low rates of interest.

Willingness of the automotive industry to share its profits with stockholders and with labor in the form of enlarged dividends, wage increases and year-end wage bonuses added to the prestige of the companies. The courage of automobile men in spending millions for new and better equipment to make better cars at lower cost could have left nothing but a favorable impression on the public. America realized that the only way out of the depression was to force the locks by offering modern products at purchasable prices. The country backed the automobile industry's program by buying cars and the securities of companies that made them.

From the very first post-crash upturn in security prices in July, 1932, prices for automobile manufacturing company stocks showed greater vitality than did other stock prices.*

One indication of the unfaltering general belief in a successful automobile future, even early in 1932, was the recommendations of investment advisory services that the automobile industry would lead in the recovery and that its securities should not be dumped at low prices. The markets were then very weak. The public is usually disposed to follow stock market advice, and it is apparent that this development must have had an effect. The advice was repeated at times throughout the year although it became apparent that only a false start had been made toward recovery. "Hold," said investment advisors then, and hold the public did, as is evidenced by the two facts that stock prices stayed above the lows and that the total number of stockholders remained at near-peak levels.

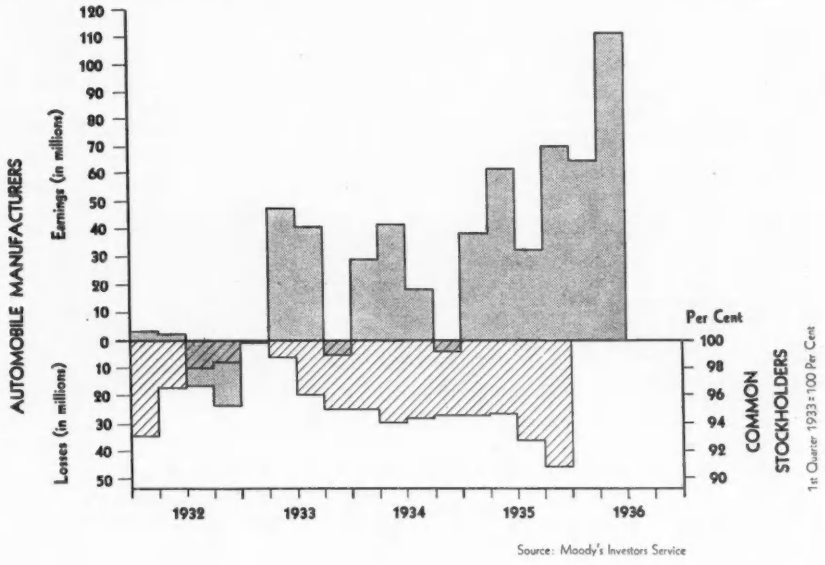


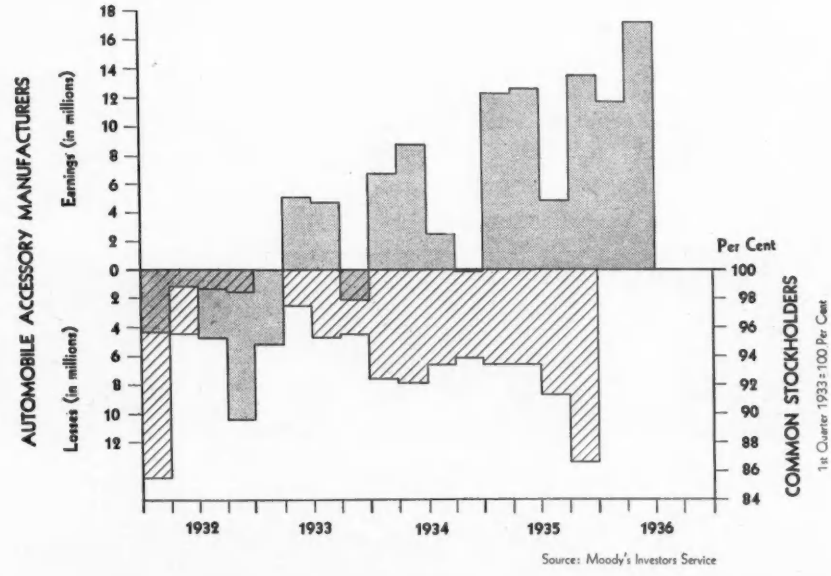
*Source: Federal Reserve Board, 1936
U.S. Dept. of Commerce, 1932-1935

Outside influences took charge of the situation early in 1933. Every curve on the chart accompanying this study shows a downtrend at the time of the bank holiday. It is notable though, that both automobile manufacturers' stocks and automobile accessory manufacturers' stocks started upward sooner than did the flat average. This breakaway must be recognized although it is realized that charted curves of small groups move more rapidly than curves of broad groups. The upturn coincided with the usual seasonal upswing in production. It is of interest to note that this increase in automobile sales was marked by aggressive advertising and some bitterness between leading competitors. It was a phase of the recovery when everybody began to fight for the first real profits. Disinterested commentators warned the advertisers to be more careful for fear of creating distrust of the cars in the mind of the public.

All stock prices and production curves on the chart again turned upward after a midsummer period of uncertainty which was probably caused by the collapse of the first "inflation" boom. The last index to rally was that

*Editors Note: Measured for the purposes of this study by comparing averages of automobile manufacturing company stocks, automobile accessory manufacturing company stock, and a flat average of all stocks listed on the New York Stock Exchange). For the year as a whole, the automobile and parts industries both had losses on the smallest production of the depression period, although car makers did manage as a whole to show small profits in the seasonally good first and second quarters.





of total manufactures. At about this time, the public was advised by investment counsellors to accumulate motor stocks slowly.

In the early part of 1934, automobile and accessory stocks began to decline after a sustained rise to levels then termed high on a price-earnings basis. Automobile production rose for two months after the securities turned downward. The flat average of all listed stocks also dropped in the spring period of uncertainty. The declines ended a second strong recovery trend, but confidence generally reappeared and toward the latter part of the year all curves began once more to rise with the gains more sharply defined in November.

During the year there appeared the first real moves of the industry to stress safety. Motor company executives recognized the peril to the future in the mounting toll of highway and street deaths. This sad record was probably due in part to the increasing age of vehicles on the road, a depression phenomenon, in part to higher power and speed, and in part to the public's exuberance over the passing of the financial storm, a state of mind that must have led to careless automobile operation.

The safety drive has never slackened since that time. It is hard to tell whether the public demanded safety once the idea caught on, or whether the manufacturers sensed that competitive advantages would be derived from offering it. Safety in design is, however, apparent in car construction today, and it is a positive sales factor.

An early 1935 decline in automobile and accessory stock prices coincided doubtless with the period of slowing business attributed by some to the continued existence of the NRA and to the government's inimical attitude toward business. Security prices started upward in April. Automobile manufacturers' stocks lagged somewhat after having fallen further than others. Automobile production began to decline quite steeply. It was the first year in which a fall show was planned, and the spring bulge in sales of many models was not an unqualified success, since many persons decided to wait for the 1936 series which would be presented in October, 1935.

A real upturn in business activity began after the famous "horse and buggy" decision by the Supreme Court killed the NRA. In the meantime, farm markets for automotive products were being strengthened by AAA benefits, a factor of no mean importance to car manufacturers. Late summer demand for automobiles from this and other sources was unexpectedly larger.

The public appeared to sense that production would have to keep pace with demand and did not take the view that new cars were being forced into the market. It bought automobile and accessory stocks, the prices of which pulled away on the upside from the other charted prices. At this point, investment holdings of motor and accessory stocks began to decline noticeably. The public seemed to begin to feel that prices were high enough and disregarded "buy and hold" advice. This is usually the case on a broad market rally. "Outsiders" as distin-

gushed from "insiders" often sell too soon.*

Fuel must have been added to the flames of the growing speculation in auto stocks by market letter advice to buy the best of the manufacturing and accessory group's junior securities. Toward the middle of the year there began to appear recommendations to buy truck company stocks. Truck advertising and visual evidence on the streets of the volume sale of new commercial equipment had, of course, an effect. In this case again, analysis, even of the most sketchy variety, could not fail to lead to the conclusion that new trucks were needed in an industrial recovery.

Active and strong stock markets continued in the early part of 1936, aided no little by continuance of the Federal easy money policy which meant that any dividend paid on automobile company profits—and others—would look large by comparison with available interest returns for money. Nevertheless, the public continued to sell investment holdings of motor stocks. Speculation increased while outright holdings dropped.

Passage of the 1936 revenue act, with its provisions for surtaxes on undistributed earnings, coinciding with new and strong indications that profits would be large this year, brought the probability of large dividends. Stocks were again bought on that basis.

Of interest in tracing the connections between the automobile industry and the public is a series of recommendations to the public for the handling of its investments.

Following are extracts from the Standard Statistics Co.'s service for the years 1932 through the latter part of 1936. The dates are the dates of the circulars, and the language is condensed from that of the circulars:

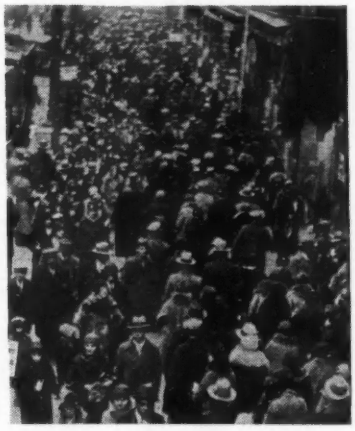
Jan. 22, 1932—Internally and externally the automobile industry is in a position to assume leadership in the next sustained upturn in general business. It can make substantial profits on a smaller outturn of cars due to improved production facilities. There is a huge replacement demand waiting to be filled. Long pull investment accounts should contain a substantial proportion of selected automobile stocks.

May 13, 1932—Retain holdings in motor stocks, but do not add to them. The earnings outlook is poor.

Sept. 9, 1932—Ditto.

Oct. 14, 1932—Ditto as to automobile stocks. Retain holdings in the two strongest tire companies as business seems a bit better. Forecast losses for parts makers.

Dec. 23, 1932—The earnings outlook for the industry is "highly restricted." There are signs of price cutting in the low priced field. Do not add to commitments, but hold speculative positions in the sounder equities.



As one indication of the amount of magazine advertising on automobiles and accessories, the Publishers Information Bureau gives the following figures:

Automobile Advertising

1932	$7,868,601
1933	5,931,071
1934	8,644,279
1935	10,316,725
1936 (10 mos.)	10,838,277

Automobile Accessory Advertising

1932	$7,158,293
1933	6,274,711
1934	6,046,261
1935	6,904,799
1936 (10 mos.)	6,569,107

April 28, 1933—The forecast at this point was very cautious, indeed, but pointed out some possibilities for automobile business to improve due to inflation outlook.

Sept. 13, 1933—Forecast irregular gain in profits. Place orders for gradual accumulation of motor stocks.

Jan. 24, 1934—See recovery in auto field. Specified stocks are not cheap, but the companies should participate in the business recovery.

April 11, 1934—Parts markers' profit margins are smaller, but the business as a whole is better. Buy on recessions for a year or more pull. Spread your commitments. Parts makers' profits should antedate business upturn.

June 13, 1934—Auto stocks outran the market and are now off sharply. The second half year's earnings outlook is unimpressive.

Oct. 31, 1934—See some signs of further improvement.

Jan. 30, 1935—Active buying of motor stocks not advised at these prices.

Feb. 6, 1935—Business in parts lines should be big.

April 24, 1935—The fall show should cut into third quarter business.

July 10, 1935—All but a small proportion of investments in motor stocks should be in those specified.

Oct. 16, 1935—Buy and hold specified stocks. The truck industry should do its best in several years.

Nov. 27, 1935—Scan investments carefully.

Jan. 15, 1936—Hold specified stocks for speculative purposes.

July 8, 1936—Investment accounts should have large holdings of automobile stocks. Business looks very large.

The efforts of automobile manufacturers to reach the public mind and to influence the public buying habits are shown in the files of *Printers' Ink*, dating from 1932 to the present. Random abstracts from these files in chronological order, representing article headings, or the subject matter of paragraphs in the magazine are as follows:

1932

More automobiles are bought by advertising than are sold through dealer efforts—Chrysler takes auto shows to the people by establishing touring units —Graham uses colored models so people can see how the cars will look—"Pat" Hurley praises the industry for beginning a $500,000,000 production program in the pit of the depression—Ford to start the "greatest" advertising campaign, using 2000 newspapers —General Motors runs 55 simultaneous

(Turn to page 664, please)

*Editor's Note: This has not been conclusively disproved by the series of Securities and Exchange Commission reports showing that scores of officers and directors sold stocks at prices much lower than now obtained.

Photomontage by Howard Kohlbrenner

How Much Automobile Advertising *Sticks* ?

By Thomas G. MacGowan *

"THE mind of the average motorist," an old-time automobile salesman once told me, "is a battle-ground on which information and misinformation, facts and fancies, truth and twaddle about cars are perpetually at war, with misinformation, fancies and twaddle usually getting a lot the better of it."

His statement, like so many generalizations about what people think and know, presents a real challenge—and in this case the challenge is of course to automobile advertisers. Decidedly it is "interesting if true."

Do the various factors in the automobile industry pour out their advertising millions without putting across their messages, without getting their slogans, their claims and their possession of features fairly well planted in the minds of their sales prospects? *Are* car-buyers' ideas on cars mainly wrong? Or is the automobile shoe, as it were, on the other foot, with the public knowing its stuff in motor matters fairly well or very well?

The answers could be learned only by a factual study of automobile consumers' information and attitudes—and from such a study only if it should cover an adequate number of persons properly selected and should make use of a sound and not too simple psychological technique.

We have just completed the first investigation of this kind to be made in this country, and as a result have, we think, found out, with a high degree of accuracy, much about what the average passenger automobile sales prospect knows of motor cars and their advertising and—more important—what he doesn't know.

Trained field workers in every state interviewed 639 men and women living in places of every size, from large cities to hamlets. The interviewers used a very long questionnaire containing the equivalent of 116 questions. We sought light on the following questions:

1. How well do people identify automobile slogans, new and old, with the cars which have advertised them? Are the old slogans generally much better than the new ones?
2. How well can consumers link up the various advertised exclusive features of construction and performance with the right makes?
3. Can they tell what cars do and what cars do not have all-steel bodies, steel roofs, hydraulic brakes and other features?
4. How many car owners or prospects know when a new car has entered the lists and made its bid for favor, or when an old contender returns to the field?
5. Have consumers a good, a fair or a poor idea of the number of cylinders of the various makes and models? How well can they give the price ranges of American passenger automobiles?

All these questions reveal the extent to which people have absorbed and classified facts and claims made and slogans used in motor advertising. They are recognition-and-memory questions. True, the consumer can survive this type of testing successfully without being a reader or hearer of advertising, but if he doesn't, the implication that he *hasn't* read or heard and remembered automobile advertising is inescapable.

In addition, we sought to shade in the rest of the picture by getting answers to these questions:

The Fight for the Public's Memory

IN the United States "I never heard of it" is a phrase which damns. Important among the functions of advertising is the attempt to fix in the minds of a large group of the population, by catch-phrase, slogan, or symbol some recognition of a particular product which shall endure by sheer force of verbal felicity or expensive repetition.

How successful has the automobile industry been in attaining such an object through its advertising? What is the quantitative measure of success as between one manufacturer and another?

Using statistical sampling methods whose utility has been proved in the national elections, Thomas G. MacGowan, president of a well known statistical organization in the marketing and advertising field, answers with *facts* the questions above. The study is small in scope, but AUTOMOTIVE INDUSTRIES shares with Mr. MacGowan the belief that the results will bear comparison with other, larger surveys which may be made later.

The data presented here show only one phase of the problem of analyzing the effect on the public of automobile advertising. Subsequent articles by Mr. MacGowan will continue the analysis. Correspondence on single articles or the whole series is invited.—THE EDITOR.

*President, Facts, Inc.

6. How well can people identify motor programs over the radio with their sponsors, and of how many automobile programs are they aware?

7. How closely do their ideas on the relative sizes of motor manufacturers' expenditures agree with the facts?

8. Do they like automobile advertising? Do they *believe* it? Do they find it more, or less, convincing than other advertising, or equally so? What are their reasons for these views?

From all these lines of questioning we present in this series of articles a picture of the motor advertising consciousness of Mr., Miss and Mrs. Public. The result is comprehensive within the survey's province, but no claim is made that every avenue of investigation possible to such a study has been explored. No attempt to measure the comparative value of various automobile methods and media has been made. We give some attention to causes, but essentially the conclusions relate, not to methods, but to results.

We interviewed 522 men and 117 women. The distribution of these people among age groups was as follows:

	No.	*Per Cent*
Under 20	4	.63
20 to 29	182	28.48
30 to 39	174	27.23
40 to 49	81	12.68
50 or over	36	5.63
Age not reported	162	25.35

Of the 639 responders, only 87 (13.62 per cent) did not own cars. Cars which had been new at the time of purchase were owned by 345 (53.99 per cent), and used cars were purchased by 207 (32.39 per cent).

In classifying our interviewers as to economic status we used the price paid for the car, new or used, as a rough criterion. The tabulation runs this way:

	No.	*Per Cent*
Up to $650	236	36.93
$651 to $975	188	29.42
$976 to $1,600	75	11.74
$1,601 and up	10	1.57
Price not reported	130	20.34

Some of the most interesting results came from the questioning on slogans or catch-phrases. Early in the questioning we presented to the responders a list of 24 slogans or catch-phrases used by automobile manufacturers, with the request that they try to identify each one with the make or makes of car sponsoring it. The question used was: "What cars have these slogans or catch-phrases?"

Slogans used by 19 makes of car (if Fleetwood be considered a make) were given. Several makes were represented by more than one slogan. There were three Dodge and three Pontiac slogans and two each for Packard, Ford, Buick and Studebaker. Several makes of automobiles were not represented by slogans, because they had none, or none which seemed to have been sufficiently publicized to be suitable for this survey.

We used only slogans or catch-phrases currently in use. A few of them were very old, like "Ask the Man Who Owns One" and "When Better Automobiles Are Built Buick Will Build Them." Most were of comparatively recent origin. Some had been used for the first time in the campaigns for the 1936 models. One, "Graduate to a De-Soto," had made its appearance well along in the present year. No regular slogan or slogan-type catch-phrase now in use was intentionally omitted; there are, however, many advertising phrases which, while appearing frequently in motor copy, are most properly classified as feature-describing phrases, and these were treated in another part of the questionnaire. We included slogans inconspicuously displayed in their sponsor's advertising as well as those prominently featured, just as we used those of cars having very small advertising appropriations as well as those with very large ones.

The findings, therefore, while they do indicate what slogans have bitten into the public consciousness and what degree of penetration they have achieved, do not tell much about *why* these results have come about and do not, of course, point to one slogan either as being intrinsically better than another or as having been better publicized. Rough conclusions of these latter types may be possible in some cases, but in the main our job is simply to show slogan-consciousness in general and for various groups of people.

Perhaps the most surprising result of the test was the discovery that women, supposedly less interested in automobiles than men, were, in their less frequent attempts at slogan identification, considerably the more accurate. Another interesting development was the fact that the older Packard and Buick slogans, the classic "Ask the Man Who Owns One" and "When Better Automobiles Are Built Buick Will Build Them," were forced to give place to a newcomer. Equally surprising were the very poor ratings gained by some of the most heavily advertised of the newer and catchier phrases. Still another stellar high-light is the victory of the younger people in identifying

There Were 522 Men

[Table I]

SUMMARY OF RESPONSES

SLOGANS	Correct Answers	Wholly correct responses		Partially correct responses		Incorrect responses		Failures to respond	
		No.	%	No.	%	No.	%	No.	%
Watch the ——'s Go By	Ford	600	93.90	...	.....	6	.94	33	5.16
When Better Automobiles are Built, —— Will Build Them	Buick	573	89.67	...	.....	19	2.97	47	7.36
Ask the Man Who Owns One	Packard	532	83.25	...	.....	47	7.36	60	9.39
The Only Complete Low-Priced Car	Chevrolet	462	72.30	...	.....	78	12.21	99	15.47
——'s the Buy	Buick	356	55.71	...	.....	58	9.08	225	35.21
The Big Money-Saving ——	Dodge	223	34.90	...	.....	83	12.99	333	52.11
—— Builds Great Cars	Plymouth	214	33.52	...	.....	123	19.26	302	47.21
The Most Beautiful Thing On Wheels	Pontiac	199	31.14	...	.....	123	19.26	317	49.60
The New Car That Has Everything	Oldsmobile	141	22.07	...	.....	105	16.43	393	61.50
The Silver Streak	Pontiac	139	21.75	...	.....	119	18.62	381	59.63
"Beauty Winner" of 1936	Dodge	114	17.84	...	.....	121	18.94	404	63.22
It Can Pay For Itself Up to 35 Miles a Gallon	Willys	100	15.65	...	.....	78	12.21	461	72.14
Graduate to a ——	De Soto	91	14.24	...	.....	101	15.81	447	69.95
Smart to Be Seen in . . . Smarter to Buy	Studebaker	71	11.11	...	.....	122	19.09	446	69.80
Match —— Against the Field	Packard	71	11.11	...	.....	156	24.41	412	64.48
Officially Proved Gas Economy Champion	Studebaker	59	9.23	...	.....	212	33.18	368	57.59
The Big Economy Six	Pontiac	56	8.77	...	.....	156	24.41	427	66.82
Costs Less to Own Than a Small Car	Dodge	55	8.61	...	.....	129	20.19	455	71.20
A New Era of Super-Performance	Graham	33	5.16	...	.....	70	10.96	536	83.88
America's Finest Six	Reo	27	4.23	...	.....	196	30.67	416	65.10
The Finest, Safest, Most Dependable —— Ever Built	Ford	17	2.66	...	.....	182	28.48	440	68.86
Out to Win America on Value Alone	Nash, La Fayette	10	1.56	92	14.40	91	14.24	446	69.80
The World's Safest Motor Car	Pierce-Arrow	3	.47	...	.....	236	36.93	400	62.60
Royal Family of Motordom	Cadillac, La Salle, Fleetwood	...	.....	152	23.79	163	25.51	324	50.70
TOTAL		4146	27.03	244	1.59	2774	18.09	8172	53.29

such old-time slogans as are being used.

In general the 24 slogans did not fare very well at the hands of our 639 automobile-memory guinea pigs:

Only five slogans out of the 24 (20.84 per cent) could be correctly identified by 50 per cent or more of the responders.

Only three (12.50 per cent) could be identified by from 25 to 50 per cent of the people.

A total of 16 (66.66 per cent, or two-thirds) could be identified by fewer than 25 per cent.

We have, therefore, a story of

marked unevenness in the degree to which slogans have lodged in the public mind. A few are very good, still fewer are fair and the majority—a big majority—are not good at all.

Lumping together all the attempts at identification and all the refusals to make an attempt, totaling together 15,336, we find that there were 7164 responses and 8172 failures to respond. In other words, in only 46.71 per cent of the cases would the person interviewed make an answer of any sort. When he did answer he was pretty good, but more often than not he wouldn't answer. Here's the summary:

Right identifications	4,146	(27.03%)
Partly right identifications	244	(1.59%)
Wrong identifications	2,774	(18.09%)
Failures to respond	8,172	(53.29%)

When a responder thought he could identify a slogan or would chance a guess, he was right considerably more than half the time. If we divide up the attempted identifications we get this: right, 57.87 per cent; partly right, 2.12 per cent; and wrong, 40.01 per cent.

and 117 Women Interviewed—Here Are the Results

Buick	Packard	Ford	Dodge	Chevrolet	Plymouth	Pontiac	Studebaker	Oldsmobile	Nash	De Soto	Graham	Chrysler	Willys	Cadillac	LaFayette	General Motors	Hudson	Terraplane	Cadillac-LaSalle	Reo	La Salle	Pierce-Arrow	Lincoln	Auburn	Cord	Nash-LaFayette	Hupmobile	Chrysler Motors	Cadillac-LaS.-Fleetwood	Others	Correct Answers
1	..	600*	..	1	2	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	Ford
573*	3	3	2	3	2	..	3	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2	..	..	Buick
3	32	15	6	7	3	3	1	2	..	1	..	1	..	4	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	Packard
..	2	22	3	462*	48	..	1	..	..	1	1	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	Chevrolet
356*	1	21	2	12	11	2	4	2	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	Buick
3	..	7	223*	19	19	10	4	1	11	..	1	..	..	..	1	..	..	3	..	..	1	..	..	..	..	..	..	..	..	3	Dodge
69	5	4	..	..	214*	..	5	..	9	..	..	16	..	..	..	9	2	..	..	..	..	..	2	..	2	..	..	..	..	..	Plymouth
5	7	1	10	1	1	199*	13	21	3	3	6	8	..	..	1	..	4	..	..	4	9	6	3	6	2	1	1	..	..	7	Pontiac
2	2	4	5	37	17	5	4	141*	1	..	1	1	..	..	8	..	..	6	..	..	1	1	4	..	..	..	..	..	..	6	Oldsmobile
3	3	..	1	..	2	139*	17	4	3	5	20	12	1	..	3	..	3	5	..	2	1	12	..	7	6	..	2	..	..	7	Pontiac
5	1	4	114*	4	12	12	28	14	7	3	8	3	..	..	2	..	7	2	..	1	4	..	2	1	1	..	..	..	..	..	Dodge
..	..	7	29	2	7	..	5	..	1	..	3	..	100*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	24	Willys
14	28	..	5	..	7	8	2	7	5	91*	1	4	..	7	..	1	4	..	..	..	4	1	3	..	..	..	..	..	..	..	De Soto
11	13	22	7	2	7	3	71*	10	2	13	2	15	..	..	1	..	4	..	..	1	6	..	2	1	..	..	..	..	..	..	Studebaker
23	71*	10	1	13	61	4	18	3	5	1	..	8	..	1	1	..	4	2	..	..	..	..	..	..	1	..	..	..	..	..	Packard
..	..	10	86	8	18	12	59*	2	3	1	32	1	6	..	..	..	..	16	..	..	..	..	1	1	..	..	..	..	..	5	Studebaker
3	2	3	58	37	11	56*	5	6	11	..	3	2	1	..	..	..	..	8	..	2	4	..	..	..	..	..	..	..	..	..	Pontiac
4	61	1	55*	2	2	10	10	2	7	6	1	5	1	..	..	..	5	1	..	1	4	4	2	..	..	..	..	..	..	..	Dodge
3	2	1	1	1	4	1	6	1	4	1	33*	5	..	1	..	..	15	9	..	1	..	1	..	4	..	..	1	..	..	8	Graham
4	1	2	21	38	21	40	6	30	14	2	5	4	1	1	..	..	2	3	..	27*	..	..	..	1	..	..	..	..	..	..	Reo
37	3	17*	79	17	24	..	1	2	4	1	..	8	1	1	..	..	2	1	..	1	..	..	..	..	..	..	..	..	..	..	Ford
4	4	4	7	11	18	13	6	5	29†	2	2	3	1	..	63†	1	3	5	..	..	..	..	..	1	..	10*	..	..	1	..	Nash, La Fayette
8	2	8	49	23	86	2	11	3	10	1	3	12	..	1	..	1	10	2	..	..	..	3*	2	..	..	..	..	1	..	1	Pierce-Arrow
2	28	..	..	1	1	..	4	2	3	1	..	8	..	88†	1	69	..	..	57†	15	7†	13	8	..	1	..	2	1	..	3	Cadillac, La Salle, Fleetwood
1133	771	766	764	701	596	529	284	258	134	133	122	116	112	104	82	82	67	64	57	55	42	41	29	22	14	11	6	4	1	64	

* Correct.
† Partially Correct.

Breaking all the responses down by the sexes, we find the following:

	Men %	*Women* %
Right or partly right identifications	29.01	26.92
Wrong identifications	18.86	14.64
Failures to respond..	52.13	58.44
	100.00	100.00

Considering only the actual attempts to identify slogans, we find that the attempts of women are right 64.78 per cent of the time, while those of men are only 60.60 per cent correct. This surprising result—showing that when women do observe and remember automotive slogans, they are more accurate than men—dovetails with some of the findings on later questions, which show that women who observe automotive matters do so with surprising accuracy.

What about an individual's age as a factor in influencing his ability at slogan identification? We may sum it up by saying that the younger the person the more he knows about slogans. Our youngest age group—under 20 years—which didn't do so well, can't be considered because the number of responders, four, was of course too small to be of any account. Among other groups, the younger the better.

Here are the percentages of correctness for the various age groups, omitting the youngest:

20 to 29 ..	31.14
30 to 39 ..	27.23
40 to 49 ..	26.03
50 or over ..	25.00
Age not stated ...	29.71

There are also these conclusions on the age angle:

The younger the person the more prone he is to *think* he can make a correct identification. Actually, the younger people get more right answers and more wrong ones.

The percentages of correctness of the identifications actually attempted or the various age groups do not show anything significant. Omitting the youngest group, the percentages are: 20-29, 61.01; 30-39, 60.06; 40-49, 66.14; 50 and over, 63.13; age not stated, 60.43.

This would of course seem to show that the older people are less cocksure and more accurate. But remember that the actual percentage of correct identification *to all persons questioned* goes down as ages go up.

With the exception of the highest-price group, it appears that the cheaper the car a man or woman owns the better his or her success at slogan identification is likely to be:

Up to $650	29.66
$651 to $975	29.15
$976 to $1,600	27.22
$1,601 and up	34.59
Price not stated	26.95

Since the highest price group (owners of cars for which they paid $1,601 and up) numbered only ten, their responses mean little if anything. As to the percentages of correctness in actual attempts at identifying the slogans, the same trend works out: cars costing up to $650, 60.32; $651 to $975, 59.91; $976 to $1,600, 59.82; $1,601 and up, 72.17; and price not stated, 65.49.

So much for the indications about how the various groups of individuals react. The score-sheet on the various slogans has many surprises. The greatest is probably the victory of "Watch the Fords Go By." This comparatively recent slogan was an easy winner. Of the 639 persons interviewed, 600, or 93.90 per cent, identified it correctly. Only six gave a wrong identification, and only 33 did not respond.

Second honors went to "When Better Automobiles Are Built, Buick Will Build Them," which was identified by 89.67 per cent of the responders, winning handily over Packard's "Ask the Man Who Owns One," which had a percentage of 83.25.

These three slogans were the only ones to score over 75 per cent. The only two others to be identified by 50 per cent or more of the interviewees were "The Only Complete Low-Priced Car" (Chevrolet), with a 72.30 per cent identification, and "Buick's the Buy," with 55.71.

Here are the ten leading slogans, with the percentages of all the responders who could identify each correctly:

Watch the Fords Go By....	93.90
When Better Automobiles Are Built, Buick Will Build Them	89.67
Ask the Man Who Owns One (Packard)	83.25
The Only Complete Low-Priced Car (Chevrolet) .	72.30
Buick's the Buy	55.71
The Big, Money-Saving Dodge	34.90
Plymouth Builds Great Cars	33.52
The Most Beautiful Thing on Wheels (Pontiac)	31.14
The New Car That Has Everything (Oldsmobile).	22.07
The Silver Streak (Pontiac)	21.75

A glance at Table II will show that

Young Folks and Women

[Table II]

SLOGANS	Correct Answers	BREAKDOWN BY SEX — Men: Correct or Partially Correct No.	%	Men: Incorrect No.	%	Men: No Response No.	%	Women: Correct or Partially Correct No.	%	Women: Incorrect No.	%	Women: No Response No.	%
Watch the ——'s Go By	Ford	490	93.87	5	.96	27	5.17	110	94.02	1	.85	6	5.13
When Better Automobiles are Built, —— Will Build Them	Buick	476	91.19	12	2.30	34	6.51	97	82.91	7	5.98	13	11.11
Ask the Man Who Owns One	Packard	446	85.44	34	6.51	42	8.05	86	73.50	13	11.11	18	15.39
The Only Complete Low-Priced Car	Chevrolet	378	72.41	67	12.84	77	14.75	84	71.80	11	9.40	22	18.80
——'s the Buy	Buick	311	59.58	48	9.20	163	31.22	45	38.46	10	8.55	62	52.99
The Big Money-Saving ——	Dodge	189	36.21	72	13.79	261	50.00	34	29.06	11	9.40	72	61.54
—— Builds Great Cars	Plymouth	172	32.98	99	18.95	251	48.07	42	35.62	24	20.55	51	43.83
The Most Beautiful Thing On Wheels	Pontiac	164	31.42	106	20.31	252	48.27	35	29.91	17	14.53	65	55.56
The New Car That Has Everything	Oldsmobile	113	21.65	88	16.86	321	61.49	28	23.93	17	14.53	72	61.54
The Silver Streak	Pontiac	115	22.03	100	19.16	307	58.81	24	20.51	19	16.24	74	63.25
"Beauty Winner" of 1936	Dodge	92	17.62	107	20.50	323	61.88	22	18.80	14	11.97	81	69.23
It Can Pay For Itself Up to 35 Miles a Gallon	Willys	84	16.09	69	13.22	369	70.69	16	13.68	9	7.69	92	78.63
Graduate to a ——	De Soto	73	13.98	89	17.05	360	68.97	18	15.38	12	10.26	87	74.36
Smart to Be Seen in . . . Smarter to Buy	Studebaker	52	9.96	97	18.58	373	71.46	19	16.24	25	21.37	73	62.39
Match —— Against the Field	Packard	60	11.49	137	26.25	325	62.26	11	9.40	19	16.24	87	74.36
Officially Proved Gas Economy Champion	Studebaker	48	9.20	182	34.86	292	55.94	11	9.40	30	25.64	76	64.96
The Big Economy Six	Pontiac	49	9.39	131	25.09	342	65.52	7	5.98	25	21.37	85	72.65
Costs Less to Own Than a Small Car	Dodge	45	8.62	109	20.88	368	70.50	10	8.55	20	17.09	87	74.36
A New Era of Super-Performance	Graham	31	5.94	61	11.69	430	82.37	2	1.71	9	7.69	106	90.60
America's Finest Six	Reo	24	4.60	170	32.57	328	62.83	3	2.57	26	22.22	88	75.21
The Finest, Safest, Most Dependable —— Ever Built	Ford	14	2.68	159	30.46	349	66.86	3	2.56	23	19.66	91	77.78
Out to Win America on Value Alone	Nash, La Fayette	88	16.86	76	14.56	358	68.58	14	11.97	15	12.82	88	75.21
The World's Safest Motor Car	Pierce-Arrow	3	.57	204	39.08	315	60.35	....	.....	32	27.35	85	72.65
Royal Family of Motordom	Cadillac, La Salle, Fleetwood	117	22.41	141	27.01	264	50.58	35	29.92	22	18.80	60	51.28
TOTAL		3634	29.01	2363	18.86	6531	52.13	756	26.92	411	14.64	1641	58.44

women were a bit better than men on the Ford slogan, and worse on the others above mentioned—a good deal worse on "Ask the Man Who Owns One." One may wonder whether their score on this classic has anything to do with its inclusion of the word "man."

Here are a few additional highlights on the individual slogans:

Buick has put across its "Buick's the Buy" in one year, and has registered it on the public mind better than 19 of the 24 slogans on the list, many of which are older.

Ford was conspicuously unsuccessful with its secondary slogan for 1936—"The Finest, Safest, Most Dependable Ford Ever Built," which was identified by only 17 persons.

Fifteen of the 24 slogans were identified wrongly by more people than identified them correctly. Notable among these slogans were the Dodge "Costs Less to Own Than a Small Car" and "Beauty Winner of 1936," Pontiac's "Big Economy Six," Packard's "Match Packard Against the Field" and the two Studebaker slogans.

More people credited the "Big Economy Six" slogan to Dodge than identified it with Pontiac. The fact that Dodge is tied up with the economy idea in the public mind is also seen in the fact that one of the Studebaker catchphrases, "Officially Proved Gas Economy Champion," was ascribed to Dodge 86 times but to Studebaker itself only 59.

The worst slogan of all in point of wrong identification was Pierce-Arrow's "World's Safest Motor Car," which was tied up with Pierce by only three responders and attributed to other cars by 236 people.

The older Buick and Packard slogans were *not* best identified by the older people, which might have been expected to be the case.

Although the Cadillac-LaSalle "Royal Family of Motordom" was this year advertised very extensively as applying to Cadillac-LaSalle-Fleetwood, only one person interviewed mentioned Fleetwood. This man thought Cadillac-LaSalle-Fleetwood had one of the other slogans. The "Royal Family" slogan went over much better for Cadillac than for LaSalle.

The Nash-LaFayette "Out to Win America on Value Alone" was connected with both cars by only 10 people. Of the 92 partial identifications a large majority were for LaFayette.

Here are the ten slogans which were most often wrongly identified—the slogans which people most often thought they could identify but couldn't. They are presented with their percentages of incorrect identification:

World's Safest Motor Car (Pierce-Arrow)	36.93
Officially Proved Gas Economy Champion (Studebaker)	33.18
America's Finest Six (Reo)	30.67
The Finest, Safest, Most Dependable Ford Ever Built	28.48
The Royal Family of Motordom (Cadillac - LaSalle-Fleetwood)	25.51
Match Packard Against the Field	24.41
The Big Economy Six (Pontiac)	24.41
Costs Less to Own Than a Small Car (Dodge)	20.19
The Most Beautiful Thing on Wheels (Pontiac)	19.26

And here is a roll of the ten slogans on which failures to attempt an identification most often occurred, with the percentages of failure to respond:

A New Era of Super-performance (Graham)	83.88
It Can Pay for Itself Up to 35 Miles a Gallon (Willys)	72.14
Costs Less to Own Than a Small Car (Dodge)	71.20
Graduate to a DeSoto	69.95
Out to Win America on Value Alone (Nash-Lafayette)	69.80
Smart to Be Seen In . . . Smarter to Buy (Studebaker)	69.80
The Finest, Safest, Most Dependable Ford Ever Built	68.86
The Big Economy Six (Pontiac)	66.82
America's Finest Six (Reo)	65.10
Match Packard Against the Field	64.48

In Table I the tabulation of all cars mentioned for each slogan is arranged with the cars most often named at the left. It is interesting to see which cars had the highest percentages of *incorrect* mentions, as we can tell almost as much about the public consciousness of a car by the wrong mentions as the right ones. Here are the ten cars with the highest percentages of wrong mentions:

Pierce-Arrow	92.68
LaSalle	83.33
Nash	78.35
Graham	72.95
Plymouth	64.09
Studebaker	54.23
Reo	50.91
Dodge	48.69
Oldsmobile	45.35
Pontiac	36.11

All of the seven cars not represented by slogans received mentions, the Chrysler car leading with 116, followed by the Hudson with 67 and Terraplane with 64.

From all this a number of more or less general conclusions seem to stand out:

Slogans of which the name of the car is an integral part seem to go rather better than others. There were eight such slogans among the 24, and five of these placed among the first seven.

It is impossible to say what type of appeal goes over best, although there seems some reason to think that slogans which are general rather than specific, and which have definite rhythm have succeeded best.

Of the 24 slogans, seven stress economy or value, three talk about beauty, two emphasize completeness, one deals with safety and one with smartness, while the remaining 10 are generally descriptive or superlative or both. Of the first 10 in consumer identification, two deal with value or economy, two with beauty and two with completeness, with four falling into the general category. The first three are of the latter type.

Slogan success seems never to have been achieved without large expenditure of money, although time appears not to be essential. There is no case in which a slogan which had *both* money and a considerable exploitation period behind it did not gain a good measure of success. On the other hand, several slogans which have been advertised heavily have failed. Why? They seem to lack "punch," rhythm, the car's name as an integral part, or appeal to both sexes.

Recognized Most

BREAKDOWN BY AGE

Under 20	20 to 29	30 to 39	40 to 49	50 or over	Age Not Stated	Correct or Partially Correct — Correct Answers
75.00	94.51	94.83	90.12	94.44	94.45	Ford
75.00	89.56	91.95	88.89	86.11	88.89	Buick
100.00	85.71	83.33	82.72	80.56	80.86	Packard
75.00	73.62	72.99	70.37	75.00	70.37	Chevrolet
.....	64.84	51.73	50.62	44.45	56.17	Buick
.....	42.31	34.48	27.16	27.78	33.33	Dodge
25.00	31.25	36.11	32.50	25.00	35.17	Plymouth
.....	37.91	27.01	27.16	27.78	31.49	Pontiac
.....	24.17	18.39	20.99	16.67	25.93	Oldsmobile
.....	28.57	18.96	23.46	16.67	17.90	Pontiac
.....	19.23	13.22	17.28	11.11	23.46	Dodge
25.00	20.33	15.52	8.64	8.33	15.43	Willys
.....	14.84	10.34	6.17	8.33	23.46	De Soto
.....	11.54	6.90	12.35	5.56	16.05	Studebaker
.....	12.64	8.05	8.64	2.78	16.05	Packard
.....	15.38	5.17	7.41	8.33	8.02	Studebaker
.....	9.34	6.32	6.17	2.78	13.58	Pontiac
.....	12.64	8.62	3.70	5.56	7.41	Dodge
.....	7.69	4.02	3.70	2.78	4.94	Graham
.....	4.40	2.87	1.24	2.78	7.41	Reo
.....	2.20	4.02	2.47	.....	2.47	Ford
.....	16.48	12.64	17.28	19.44	17.90	Nash, La Fayette
.....	1.10	.....	.....	.....	.62	Pierce-Arrow
.....	28.92	25.86	16.05	27.78	21.60	Cadillac, La Salle, Fleetwood
15.63	31.14	27.23	26.03	25.00	29.71	

New DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Transmissions

Fellows Gear Shaper Co. Makes Graham Variable Speed Units

A NEW type of variable-speed transmission has been placed on the market by Graham Transmissions, Springfield, Vt. It is enclosed in a compact housing of approximately motor size and furnishes any desired output speed from half motor speed down to zero and reverse. This wide range of speed is obtained through a single turn of a control wheel.

The unit is self contained, running in oil, has only five major parts, and is simple in construction and operation. While dispensing with belts and using metallic rolling contact instead, it still retains the load-limiting features of most belt-driven units and supplies inherent overload protection.

The power is commonly taken from a constant-speed motor, the shaft of which is connected to carrier, the latter therefore rotating at motor speed. The carrier supports three taper rollers which are kept in intimate contact under pressure with a non-rotating ring and thus must turn at motor speed times the ratio of ring and roller diameters at the point of contact.

The three rollers carry planet pinions which mesh with an internal gear, the latter being connected to the output end of the unit, thus providing a step-down ratio combined with speed variation. The variation in speed is obtained by moving ring along the taper rollers, which changes the diameter ratio of these two members. In this way infinite speed range plus reverse is combined in one unit.

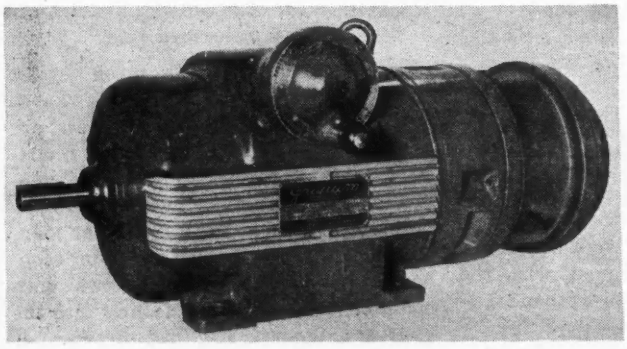
The internal gear is made of a non-metallic material to insure quiet operation. The transmission operates equally well in both directions of rotation. It can also be driven from the output end, where a slow-running line shaft must supply power at variable speeds to a high-speed machine.

The Graham transmission is obtainable in several combinations. The motor can be built-in or it may be connected to the driven machine by a flexible coupling, motor and unit being retained on a common bed plate. The unit may also be driven from a line shaft, or other source of power. It is so designed that a geared head can be incorporated at the output end, without appreciably increasing the overall length. The geared head provides a reduction up to 7 to 1, or a set-up as high as 1 to 4. With the latter arrangement a top speed as high as twice motor speed can be obtained. With the reduction gearing, full motor power con be developed at a top speed of 60 r.p.m. This is especially advantageous for low speed, high torque drives.

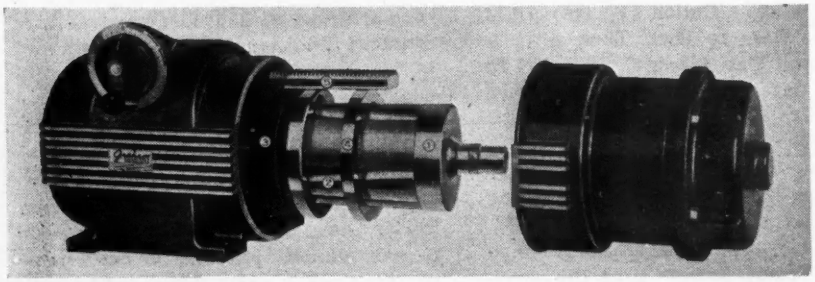
It is claimed that only a few pounds of pressure and a single turn of the control wheel are required to pass through the entire speed range and that the transmission is especially adapted to remote or automatic control, by pressure or tension device, cam, pilot motor, Selsyn, or other commonly-used method. The curve between motion of the control rod and output speed is substantially a straight line, which simplifies automatic control.

A unique "joggling" control has been devised, which is particularly desirable for cyclic operations, where the drive shaft is to be rotated at a pre-selected speed, then rapidly stopped and restarted. The same device is adapted to "inching" operations of various kinds. Control of the unit is effected without stopping the motor or disturbing the pre-set speed, the driven shaft being brought back automatically to the set operating speed, when the "inching," "reloading" or similar intervening operat ins are completed.

The Graham transmission at present is available in three standard sizes with a range of capacity up to 7½ hp., and in two speed ranges, normal and extreme. Both units are available with or without geared heads. The normal range (4:1) is especially suited for constant-horsepower applications; the extreme-range unit provides speeds down to zero and reverse. This transmission is being manufactured for Graham Transmissions by the Fellows Gear Shaper Company, Springfield, Vt.



Graham transmission with built-in motor



Graham transmission dismantled to illustrate construction and operation

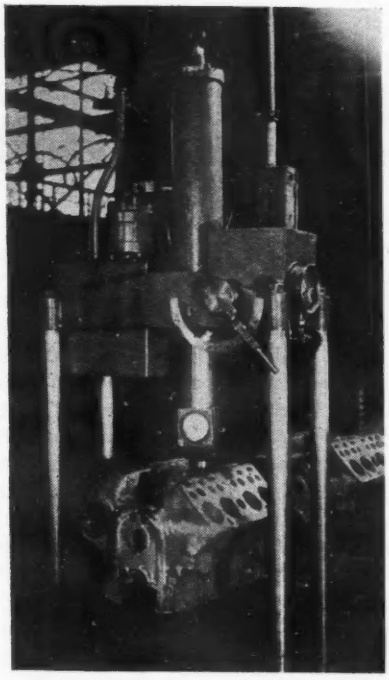
Power Brinell

Machine of Large Capacity for Testing Cylinder Blocks

A power driven Brinell machine of large capacity designed primarily for the rapid testing of cylinder blocks of different sizes has been developed by the Detroit Testing Machine Co., Detroit.

With this equipment tests can be made without grinding or spotting and the use of a microscope. After tolerance hands are set to the desired limits, the operator simply notes that the indicator pointer stops within them.

Rams are arranged one within the



Detroit power driven Brinell machine

other. Upon operation of the control valve both rams come down together with the outer one slightly below the test ball. Immediately the outer or clamping ram comes into contact with the block to be tested, pressure builds up in the cylinder until a load of approximately four tons is applied. When this occurs, the oil is admitted to the cylinder containing the test ram and the Brinell load of 3000 kgs. is transferred from the clamping ram to the test ball making the test. This takes place automatically. Reversing the control valve causes both rams to rise, releasing the block.

By a unique port arrangement, the height of the ram is in direct relation to the position of the operating lever. Thus it is not necessary for the ram to ascend more than enough to accommodate the next block to be tested.

Oil is used as a pressure medium. This oil is kept at a constant temperature with a thermostatically controlled heating element and is not subject to viscosity changes due to varying temperatures.

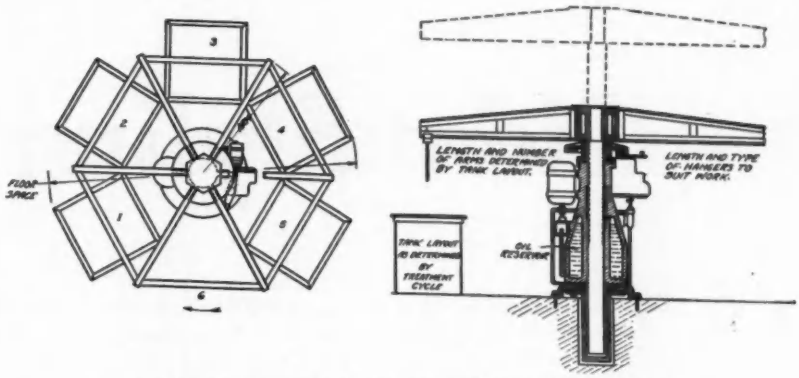
Milling

Automatic Hydraulic Operation With Sundstrand Rigidmil

The Sundstrand Machine Tool Co., Rockford, Ill., has recently developed a Rigidmil having an automatic hydraulic operating cycle which includes actuation of the spindle-head and clamping both ends of the cross rail as well as hydraulic feed and rapid traverse in both directions of the table of 72 in.

Machine illustrated is for milling five intermittent keyways in eight heavy shafts simultaneously. Depth of cut is held within .002 in. The spindle-head rapidly approaches the work, feeds to depth against a positive stop and clamps hydraulically. The table feeds to a predetermined distance; the head unlocks, rises, table advances to position for next cut and this cycle is repeated until all keyways are completed. Then the table rapidly traverses to starting position and stops.

The manufacturer states that the Sundstrand Hydraulic circuit is equally effective in both directions and entirely suitable for "climb cut" milling.


FLOOR SPACE
LENGTH AND NUMBER OF ARMS DETERMINED BY TANK LAYOUT.
LENGTH AND TYPE OF HANGERS TO SUIT WORK.
TANK LAYOUT IS DETERMINED BY TREATMENT CYCLE
OIL RESERVOIR

Bullard automatic station-type descaling machine

Descaling Machine

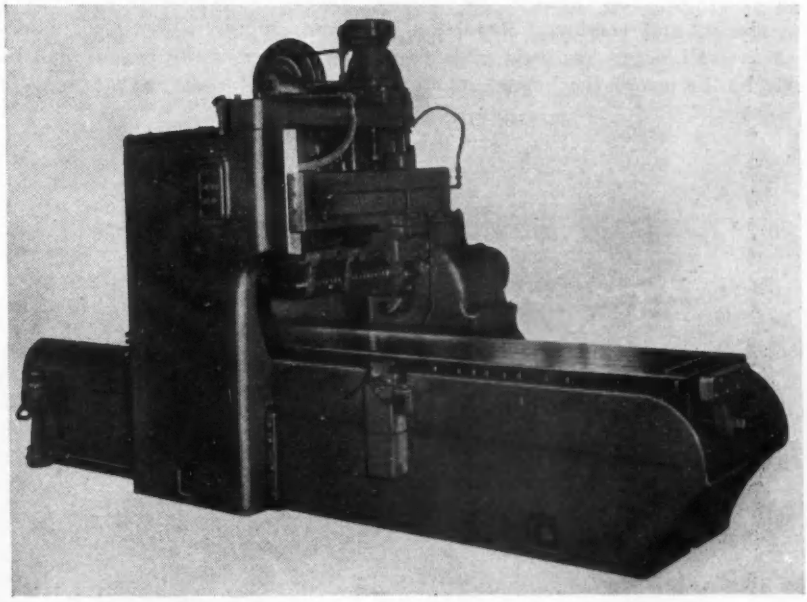
Grease, Dirt and Scale Removed By Bullard Automatic Process

The Bullard Co., Bridgeport, Conn., has developed a full automatic station type descaling machine for degreasing and descaling metals. This machine consists of a central column carrying radial arms, and from each of these arms racks, hooks or steel baskets for holding the work are suspended.

The treating process, called the Bullard-Dunn Electro-Chemical Process, comprises an electrical treatment for the removal of grease and dirt followed by a second electrical treatment in which the scale is said to be removed without pitting, etching or other damage to the work.

In action, work is placed on the machine at the loading and unloading station. The column then raises, indexes and lowers the work into the first treatment tank. The next operation of the machine is to raise, index and lower so that the work first placed on the machine is advanced to the second treatment tank, while the second load is simultaneously placed in the first treatment tank. This sequence continues until all of the arms have been loaded. When work completes the treatment cycle it is delivered at the unloading station where it is removed from the machine and replaced with a fresh load of unclean work.

(Turn to page 650, please)



Sundstrand Rigidmil with automatic hydraulic operating cycle

New Styling Marks the

CHEVROLET this year again will have two lines, identical in chassis, engine and body design, except for the front-spring suspensions, rear-axle and steering-gear ratios, and trim and accessory equipment. This year the two lines will be known as the Master and the Master DeLuxe. Knee action is now standard equipment on the Master DeLuxe models (no additional cost), while the Master models are obtainable with semi-elliptic front springs only.

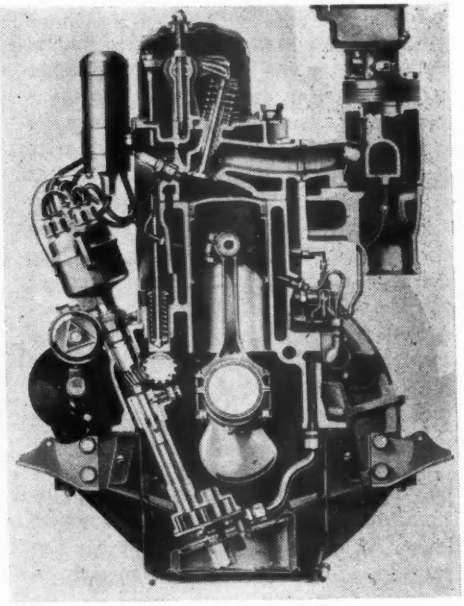
New features common to both chassis models include diamond-crown-speedline styling, all-steel bodies with solid-steel turret top and unisteel construction, safety plate glass all around without extra charge, box-section side rails and cross members in chassis frame, a new six-cylinder, high-compression, valve-in-head engine of 85 hp., and hypoid-gear final drive. The engine has a larger bore and a shorter stroke than last year's model. Improved performance is obtained as a result of greater horse power/weight ratio.

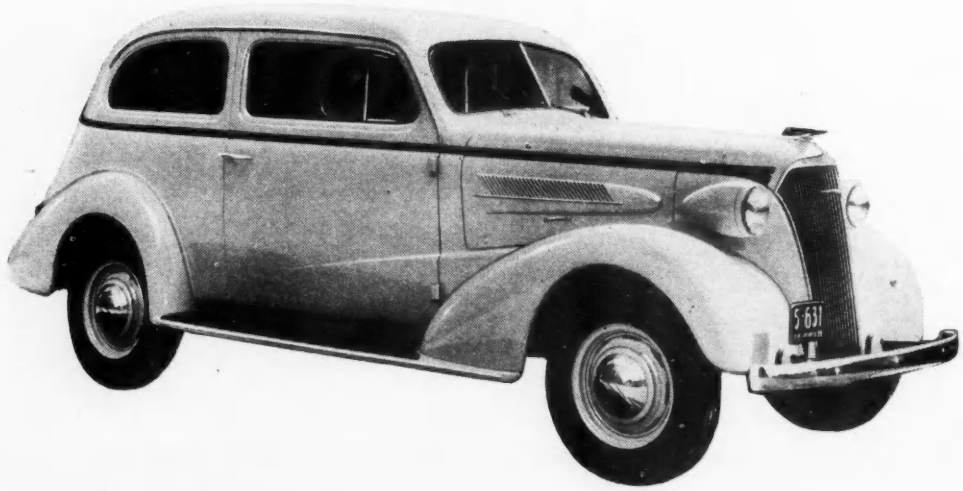
Although extensive design changes have been made, the general engineering practice developed by Chevrolet in the course of years has been closely adhered to. Chassis units for the most part have been made more compact, with a resulting gain in strength and reduction in weight. The objects aimed at were improved performance, safety, economy, and comfort. Reduction in the overall height has been made possible by the use of the hypoid rear axle, while increased roominess has been obtained by the re-location of the power-plant and the body on the chassis frame. Greater strength and durability result from the combination of the new box-girder frame and all-steel body. Greater car stability has been procured by lowering the center of gravity, and through wider spacing of rear springs and the use of tires of larger cross-section on wider rims.

Features of the new bodies aside from the new all-steel construction, include greater visibility, through wider windshield and larger windows; wider seats, and completely new interior styling. Every model has roomy luggage space either in a built-in trunk or in large compartment behind the rear seat. In addition, every model has a package ledge at the top of the rear seat, and a spacious compartment in the instrument panel.

Body styles available in both lines include a sedan, coach, business coupe, sport sedan with trunk, and town sedan with trunk. In the Master De Luxe line there is, in addition, a sport coupe with rumble seat, while a cabriolet with rumble seat is mounted on the Master chasis but has De Luxe appearance features.

All 1937 bodies are lower and longer. Lines are less rounded than on previous models. "Speedlines" extending from the hood into the body and doors are used to emphasize the sleekness of appearance. Both the windshield and the body rear line slope more sharply. At the front the body is nearly 5 in. wider at the floor level, 1½ in. wider at the windshield, and 2 in. wider between the doors across the front seat. The floor is 2 1/16 in. lower than in 1936 models, an improvement made possible by the adoption of the hypoid rear axle and box-girder frame. All floors and toe boards are of steel. A foot rest is formed in the rear-compartment floor. Trim, hardware, molding finishes, and equipment are all new. In the new in-





1937 Chevrolet Master coach

Two New Chevrolet Lines

strument panel, dials are grouped directly in front of the driver and have indirect illumination.

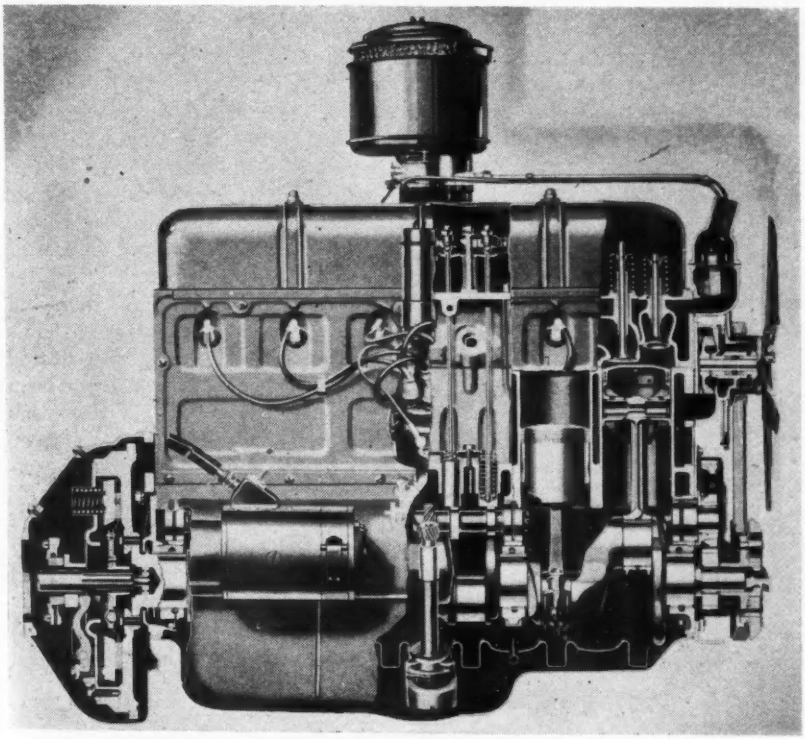
In the construction of the all-steel body, the top, double cowl, body panels, and floor are welded into an integral structure. Doors, also, are entirely of steel.

The new box-girder frame is similar in construction to that used in the 1936 Chevrolet Standard models, and is both lighter and stiffer than the elaborately-braced type formerly used. Both the side rails and the four cross members are of box section. Owing to the simpler frame design, chassis units are more accessible for inspection and servicing. The engine front support is a double-box-section member instead of an open section, as formerly. Step hangers, battery-support brackets, spring hangers and other attaching parts are fastened directly to the side rails, and the springs are directly under the side rails. The steering gear is mounted on the top of the side rail. Wherever heavily-loaded bolts pass through box-section frame members, they are run through reinforcing tubes.

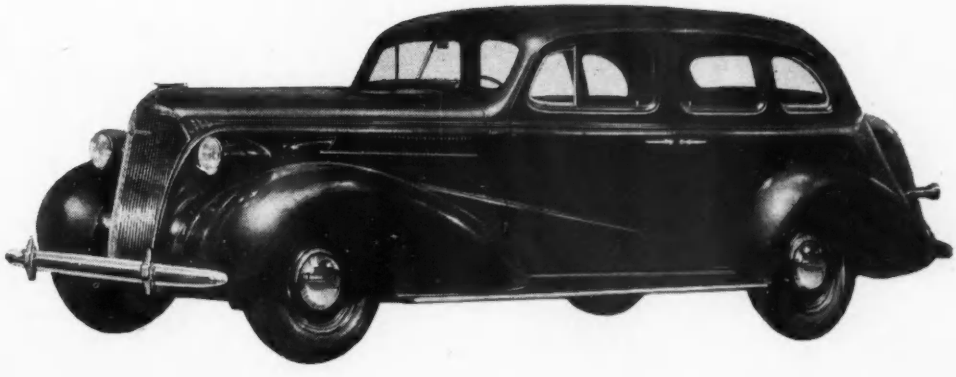
The new Chevrolet engine is of 3½ in. bore by 3¾ in. stroke, instead of 3 5/16 by 4, as formerly. Its displacement is 216.5 cu. in. (formerly 206.8). The compression ratio has been raised from 6 to 1 to 6.25 to 1. Increased power and greater torque are available at all engine speeds.

The new engine has four crankshaft bearings, instead of three, with an 8 per cent increase in main bearing area. Crankshaft bearings are steel-backed babbitt. They are of graduated diameters, increasing by 1/32 in. from the front, which is 2 11/16 in. in diameter, to the rear, which is 2 25/32 in. The crankshaft weighs 68 lb., is counter-balanced, and is equipped with a new harmonic balancer, lighter in weight and more sensitive.

The cast-iron, domed-head pistons are lighter than those previously used and have slipper-type skirts; they are well ribbed. Connecting rods are shorter and stiffer, with bearings of 2 5/16-in. diameter and 1 5/16-in. length. The camshaft now has four bearings and increased bearing area. Bearing diameters range from 2 1/32 in. (front) to 1 27/32 in. (rear). All camshaft bearings are steel-backed babbitt.



Chevrolet's engine for 1937 has been completely redesigned, while retaining many familiar details. Front and side cut-away views show interesting points of difference



1937 Master DeLuxe sport sedan

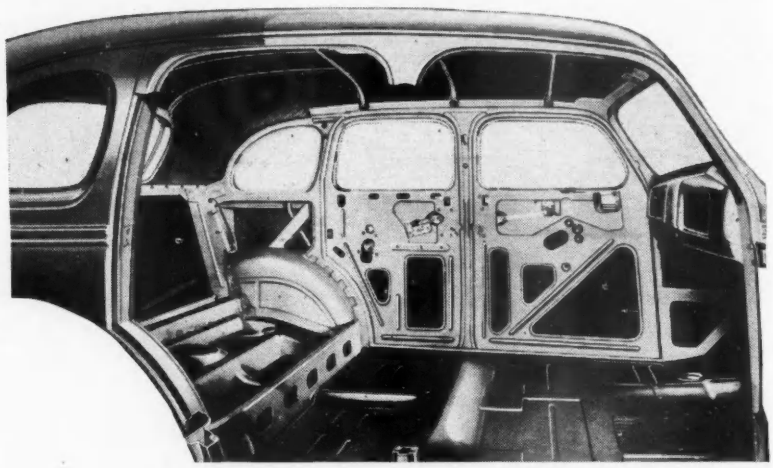
Manifolding has been improved to give better heat control in conjunction with the thermostat control. The outlet to the exhaust pipe is now in the center of the engine.

Accessory equipment includes a new air cleaner with easily removable filtering element; a gear-type oil pump, replacing the former vane type; a shorter, self-adjusting, leakproof water pump, and a new fuel pump with high reserve.

The syncro-mesh transmission also is completely new, being more compact and of more rigid construction. The syncronizing mechanism has been simplified through the use of improved cone clutches. A new type shifter interlock is used, and the shifter yoke now straddles the gears instead of operating on one side only. The transmission case, torque-ball socket, speedometer-gear housing and rear-support pad are cast in one piece.

The torque tube, which is longer, is increased in diameter to add to its rigidity. Propeller-shaft bushings in the torque tube have been re-spaced to prevent propeller shaft whip.

The rear axle is unchanged in general design but has hypoid gear drive. Since the drive pinion engages the ring gear at a point well below the center of the ring gear, the propeller shaft is 1½ in. lower than in the former drive, a change that has permitted lowering the entire chassis frame and body. The ring gear itself is smaller in design. With the new drive there is greater contact area between gear teeth. The differential has been re-located, being offset 9/16 in., to equalize the load on the rear-axle bearings. Side bearings are of the Hyatt barrel type. Axle weight has been reduced, with a corresponding decrease in unsprung weight.



Chevrolet bodies by Fisher for 1937 feature all-steel, completely welded construction, marking the passage of Fisher to the unisteel idea

Throughout the chassis, units that adhere closely to Chevrolet previous practices have been improved in detail. There is no change in the knee-action front-end suspension, except for the use of floating bronze bushings instead of needle bearings at the upper and lower ends of the king pins. Rear springs have been reduced in length to 49 in., to bring the front and rear-end frequencies closer together. They are on wider centers, mounted directly underneath and in line with the side rails of the box-girder frame.

Braking is unchanged, the double-articulated brake-shoe linkage being hydraulically expanded within drums of cast iron and steel, with external cooling ribs. The pedal support is now cast integral with the main hydraulic cylinder, which is fastened to the chassis frame. Both the brake and clutch pedals now have detachable pedal stems. Pedal pads are centered on the stems. No changes have been made in the clutch, but the inspection opening in the clutch housing has been improved, and a one-piece flywheel underpan facilitates garage operations.

Fuel tank fillers now extend through the right rear fender. All the ordinary supply operations are thus performed from the curb side of the car. This is a safety measure, as the fuel tank, crankcase and radiator fillers are all on the right-hand side, out of the traffic lane. Fuel tanks have a capacity of 14 gal., except on the business coupe, which is equipped with an 18-gal. tank mounted in the center of the chassis.

The steering gear is made more accessible and given a more rigid support by mounting it on top of the frame side rail. Wheels are of the steel-spoke disk type, now in design, with massive hubs. Tire sizes have been increased from 5.50-17 to 6.00-16. The copper-core radiator is so mounted that it may be removed without disturbing the radiator shell and grille; its filler neck has been re-located to permit easier inspection of the water level. Spare wheels and tires are mounted inside the built-in trunks and on concealed carriers of trunkless models.

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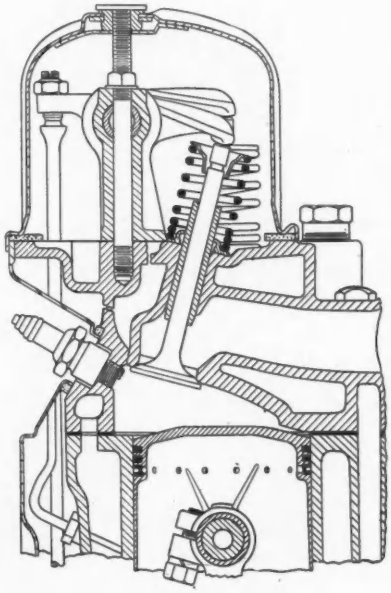
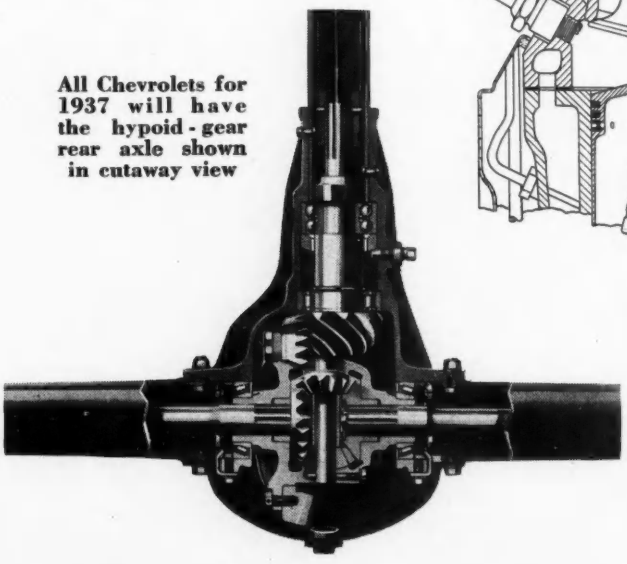


Above:
Detail of valve arrangement and combustion chamber in the new Chevrolet engine. Displacement has been increased nearly 10 cu. in. over last year's



All Chevrolets for 1937 will have the hypoid-gear rear axle shown in cutaway view

Engine Options on '37 Ford Line

An 85 hp. or 60 hp. V-8 powerplant available on standard types. All steel, freshly styled bodies are among the new features.

The radiator grille gives the new models a new frontal appearance

A NEW Ford V-8 for 1937, presenting definite changes in styling, and powered either with the 85 hp. V-8 engine now in use or a 60 hp. V-8 "economy" engine, which is a smaller counterpart of the present engine, has been announced, by the Ford Motor Company.

The new cars will be shown for the first time publicly at the Ford-Lincoln automobile show opening next Wednesday (Nov. 11) at Hotel Astor, New York City. The cars will go on display next Saturday (Nov. 14) at Ford dealer showrooms throughout the United States.

Disclosure of the new lighter "economy" 60 hp. engine as an optional powerplant for the new Ford V-8 for 1937 sets at rest rumors of a new "baby" Ford which have been circulated in the automobile industry for the past several years.

The new cars will be available in both de luxe and standard body types on the single Ford V-8 112-in. wheelbase chassis. De luxe types will be powered only with the 85 hp. engine. In standard types, either the new 60 hp. engine or the 85 hp. engine is optional.

Beyond the new appearance and the two engine sizes, two other important features mark the new 1937 cars. One is a new all-steel body, with new one-piece steel top, as well as steel structure, panels and floor. The other is a new braking system, designed by Ford to give "soft" easy-action control. The brakes are actuated through a cable-and-conduit system and have controlled self-energizing action.

A new club coupe is the latest of the eleven body types which will be available. The five most popular types will be offered with or without de luxe equipment, and with either engine. The other six will be available only with de luxe equipment and only with the 85 hp. engine.

The new 60 hp. V-8 engine is not entirely new, except to the American continent. Ford cars built in England and France for the European market have been powered with this V-8 engine for more than a year. The engine is rated at 21.63 hp., for tax purposes, as against 30 hp. S.A.E. rating for the larger Ford V-8.

For the first time, bodies are all-steel, including a new steel top, as well as structure, panels and floor. Windshields are V-shaped. They are hinged at the top and can be opened. Windshield and all windows are of safety glass as standard equipment. Improvements in body arrangement include a large new luggage compartment. Extra tire is carried in this compartment except in single-seat cars; in these the tire is carried back of the seat.

Refinements in the 85 hp. V-8 engine, which are found also in the new 60 hp. engine, include improved cooling, new cast alloy steel pistons and larger "insert" type main bearings. Engine features such as dual down-draft carburetion, floating connecting rod bearings and forced crankcase ventilation are retained.

Flying Boat for South Atlantic Service

THE French firm Etablissements Liore & Olivier is building for the South Atlantic service a four-engined flying boat of 17.5 tons capacity. It will be equipped with Hispano-Suiza Y-type engines of 860 hp. each. It is a monoplane with central shell and ballonets at the ends of the wings, the wing span being 117 ft. Great attention is being given to streamlining and to smoothing the surfaces exposed to the air. All rivet heads will be countersunk.

The plane, which is being built for Air France, will have a speed of 224 m.p.h. With a head wind of 20 m.p.h. it will have a radius of action of 2000 miles.

The bodies of the new Willys line are the work of Amos Northrup. The line consists of six models. The one shown here is the five passenger DeLuxe.

• • •

ALTHOUGH it remains in the low-priced class, the Willys car for 1937 has been greatly changed in outward appearance—much to its advantage—and has again become a standard-tread car. The new cars, that is the bodies and sheet-metal parts, are the work of Amos Northup. About the only thing that reminds one of the former Willys is the headlamps submerged in the wide fenders. The well-rounded front of the engine compartment does not give any suggestion of a radiator behind it. Rows of chromium-plated louvres extend around the hood.

The new line consists of a five-passenger, four-door sedan and a coupe, both in Standard and DeLuxe forms, with an overall length (over bumpers) of 175½ in., which is 11½ in. longer than last year's model. Tires are 5.50-16 in.

The highest point of the curved roof is 65 in. above the road level. Within the long rear deck the spare tire is housed and there is also space for luggage under this deck. In the sedan there is 13 cu. ft. of luggage space, which is accessible through a door in the rear-deck panel. If additional luggage space should be needed in an emergency, the rear seat and back cushion may be removed. In the coupe the luggage space measures 38 cu. ft.

Disc wheels and large chromium-plated hub caps enhance the exterior appearance. The curved running boards are not anchored to the front fenders. The one-piece hood is hinged at the rear and is lifted in front. To minimize trouble from headlight glare, the one-piece windshield is sloped. Safety glass is used in all door windows and these glasses are uniform in dimensions and therefore interchangeable.

The new models are finished in Dulux synthetic enamel and are available in six standard colors. Dulux gives a glossy finish which is said to be durable and gloss-retaining. After its application it is baked at a temperature of 225 deg. F.

The front seat, which is 50 in. wide, is in one piece and adjustable. Bodies are of all-steel construction. Inner door panels are covered with upholstery material that matches the seat coverings. A light above the rear window takes the place of the former dome light. There are upholstered arm rests in the rear compartment. The brake lever has been located under the cowl, to provide more room in the driver compartment.

There are two large chromium-plated dials at the center of the new instrument panel. The speedometer is of the needle type and oil and gasoline gages are electrically operated. An ammeter completes the instrument equipment. Choke- and throttle-operating handles and a light control are carried on the instrument board on the driver's right. Spark control is automatic. There are glove compartments on both sides of the cowl.

The transverse front spring is 3 in. longer than in the previous model, and the passenger weight is more nearly equally divided between the front and rear axles. Direct-acting or cylinder-type shock absorbers are fitted.

A new Gemmer steering gear has replaced the old one. Knuckle pins have been enlarged in diameter, to decrease the rate of wear of their bearings. There are larger bearings also on the shaft of the rear-axle pinion, and the two bearings have been placed farther apart, with a view to reducing the loads on them. Synchro-shift transmissions are used on all models. Clutch and brake pedals are now provided with lubricators, to prevent them from sticking on their shafts. The clutch-release bearing is of the self-lubricating type and

needs no attention for lubrication in service.

Bendix duo-servo four-wheel brakes are fitted. To eliminate the hazard of tire-chain interference, the rear brake cables are now placed inside the frame rails. Brakes are 9 in. in diameter and have linings 1¾ in. wide.

The four-cylinder Willys engine of former years is continued. It has a bore of 3⅛ and a stroke of 4⅜ in. and is rated 48 hp. at 3200 r.p.m. A Tillotson downdraft carburetor is fitted, and to eliminate hazards of vapor lock, the fuel pump is better shielded from hot parts than in the past. The engine has a four-point rubber mounting. Main bearings are of the interchangeable type. Tappet guides are integral with the engine block. Steel inserts are used for the exhaust-valve seats, and these inserts in conjunction with the use of silicon-chromium steel for the exhaust valves are said to obviate the need for frequent valve grinding.

Pistons are of cast iron and carry three compression rings and one oil ring each. Piston pins float in the bronze-bushed upper ends of the connecting rods and the unbushed piston bosses. Pressure lubrication is provided for all main, connecting-rod and camshaft bearings, and the timing chain is also positively lubricated. The piston pins are now larger in diameter.

The water pump and fan are a single unit mounted at the front of the engine and belt-driven. The load due to belt tension is taken on a ball bearing. Starting and lighting units are of Auto-Lite manufacture. The 13-plate USL storage battery is located in a compartment provided for it in the right front fender and is accessible when the hood is lifted. Other improvements in the way of engine accessories include a new intake manifold and a larger air cleaner and silencer.

The single-plate clutch and three-speed transmission are of conventional design. The former is the 8-in. size and has a spring damper. Ball bearings are used on the main shaft of the transmission. Movement of the clutch pedal is transmitted to the clutch by a flexible cable, so that engine vibration does not disturb the pedal. The steering gear is mounted on top of the frame rail and the inclination of the steering column can be varied to suit the driver's requirements.

Other features to which attention is being called by the manufacturer include remote door controls, rubber-covered pedals, an accelerator pedal of a new non-rattling design, and concealed door checks. The glasses in the front doors can be lowered until they are out of sight. One tail light is provided on the Standard models, while there are two on DeLuxe models.

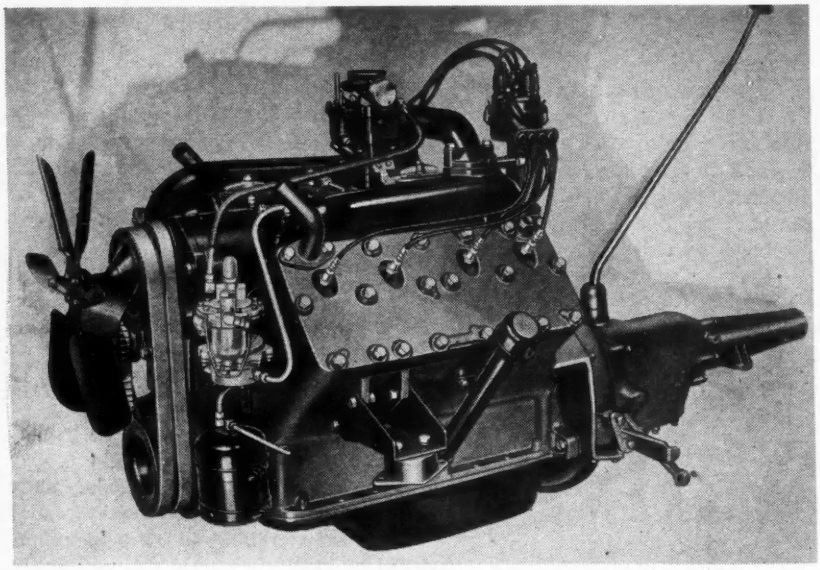
Two commercial units are being offered by Willys, a panel delivery and a cab pick-up. Inside dimensions of the panel delivery are 64¼ in. in length, 43 in. in height, 39¼ in. in width at the floor and 35¼ in. in width at the door opening. The cab pick-up is 40⅞ in. in width, inside, 57 in. in length, and 11¾ in. high from the floor to the bottom of the flare.

The New Willys

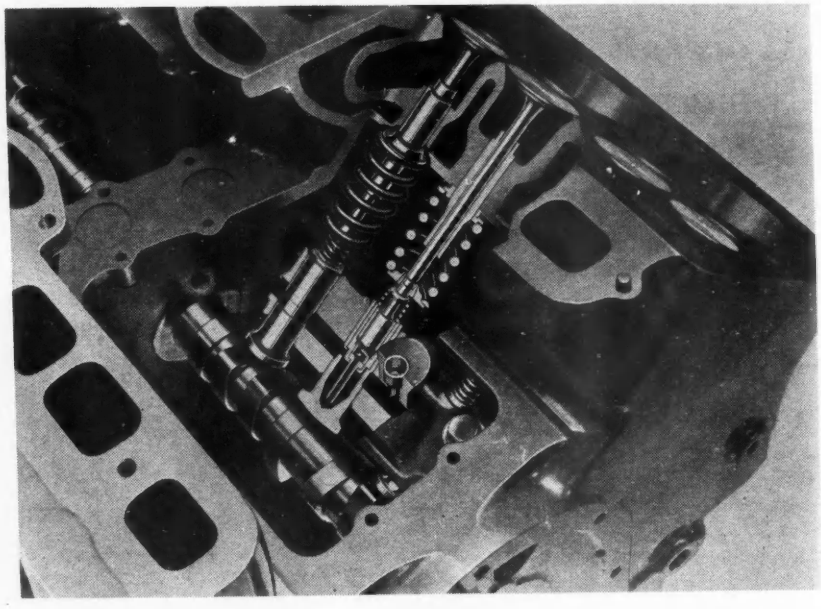
has newly styled bodies, 175½ inches overall, and a standard tread. The engine is rated at 48 hp. Besides the passenger car models there is a panel delivery truck listed.

The new Willys is different in appearance from the former models. This new front gives no suggestion of the radiator behind it

Cadillac-LaSalle Models



The new V-8 powerplant of the LaSalle, showing oil cleaner in foreground, together with fuel pump and generator (in Vee). Also engine-mounting bracket.



New type of automatic valve clearance adjuster with jiggle pin that bleeds air from the oil.

SEVEN chassis models and thirty standard body types, twenty of these by Fleetwood, constitute the Cadillac and LaSalle lines for 1937. The most outstanding development is the adoption of a V-8 engine for the LaSalle, a modification of the former V-8 engine of 322 cu. in. displacement, which supersedes the straight eight. The wheelbase of the LaSalle has been increased 4 in.

Cadillac Series 65 is a new model with a chassis similar to that of Series 70 but equipped with a Fisher body, and is intended for buyers who desire a bigger car priced below the Fleetwoods. The Series 80, short-wheelbase Cadillac V-12 has been discontinued.

The LaSalle and Cadillac 60 chassis are entirely new and carry all-steel Fisher bodies with turret top. The new bodies are wider and longer, with increased leg room and larger trunk space. Visibility is much improved, particularly from the rear seat. Styling has undergone considerable change, what with redesigned radiator grilles, die-cast of zinc alloy; unique louver treatment on the LaSalle and Series 60, and a new fender and hood treatment.

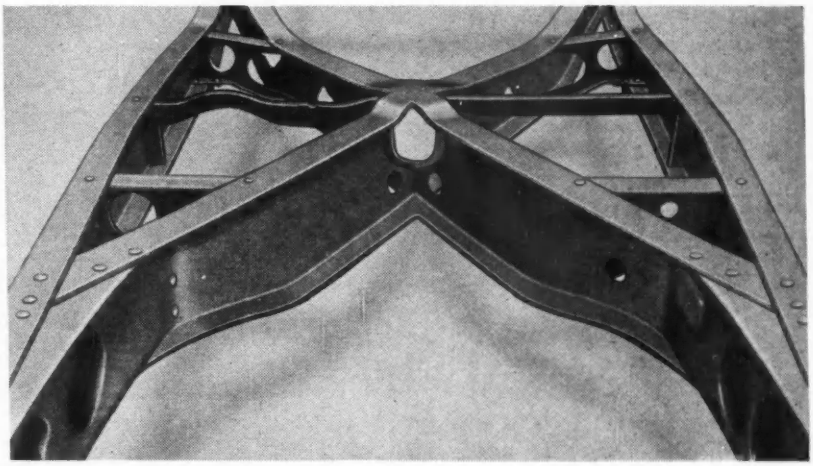
Acceleration and hill climbing ability of all models have been improved by weight reduction, especially on the Series 60, 65, and 70, and the LaSalle has the additional advantage of a much larger engine. Roadability of all models has been improved, the high-speed ride being "flatter" and the steering more steady.

All 1937 models have larger engines turning over at lower speeds for a given car speed, and new, more-compact and lighter transmissions. A hypoid rear axle is used on the LaSalle, and a new three-point mounting and improved hydraulic valve lifters are found on all V-8 engines. The LaSalle and Cadillac 60 have a new steering system with transverse drag link and improved steering geometry and greater steering ease due to the elimination of the caster angle. These same models have frames with an I-section X-member.

Independent springing is continued with refinements. There are stabilizers at both front and rear on all lines.

On the La Salle and the Cadillacs 60, 65, and 70, engine speeds have been reduced by changing to lower axle ratios, which was made possible by the increased engine output and the greater power-to-weight ratios on all

have larger engines and new transmissions for 1937



Reinforced I-section X member of frame

models. Standard rear-axle ratios on the different models are now as follows: LaSalle, 3.92; Cadillac 60, 3.69; Cadillacs 65 and 70, 4.30; Cadillac 75, 4.60.

The new LaSalle engine also has the closed cooling system that was used on 1936 Cadillacs. The radiator filler cap (in which the automatic relief valve is located) now has a bayonet joint, equipped with a safety catch, which facilitates its removal and replacement.

As regards the high-priced sixteen-cylinder Cadillacs, which appeal to a more conservative clientele, this line remains unchanged in appearace and body styles, but a number of mechanical changes have been made. A front stabilizer has been added, so there are now stabilizers on these cars at both front and rear. Mechanical brakes have been superseded by hydraulic brakes, and these are actuated by a vacuum booster. Ribbed cast-iron drums, 14 in. in diameter and 2¼ in. wide, are used, the brake mechanism being similar to that on Cadillacs 75 and 85. Primary shoes have molded, secondary shoes woven, brake lining. The reinforced frame is continued, except for minor changes to accommodate the front stabilizer.

The engine of the new LaSalle has 3⅜ by 4½-in. L-head cylinders (322 cu. in) and is rated 125 hp. at 3400 r.p.m. with cast iron head and standard compression ratio of 6.25. An optional compression ratio of 5.75 is offered—principally to meet export requirements.

Lynite pistons with T-slot and anodized finish are used, with two oil rings and two compression rings per piston. Connecting rod bearings are of steel-backed babbit, main bearings of bronze-backed babbit. The crankshaft is fully counterweighted, but no vibration damper is used.

Cadillac Series 60, 65, 70 and 75 all use the same engine, a V-8, L-head type of 3½-in. bore by 4½-in. stroke (346 cu. in.) rated 135 hp. at 3400 r.p.m., with cast-iron head and a compression ratio of 6.25. An optional compression ratio of 5.75 is offered, principally for export.

Low-expansion aluminum pistons are used, with T-slot and anodized. Two oil rings and two compression rings are used. Connecting rod bearings are of steel-backed babbitt, main bearings of bronze-backed babbitt. The crankshaft is fully counter-weighted and fitted with a vibration damper.

All V-8 engines have the following design features in common: W.-R. hydraulic valve lifters which have been redesigned to eliminate the oil reservoir in the bracket and now have a

LaSalle coupe has a new engine and cooling system

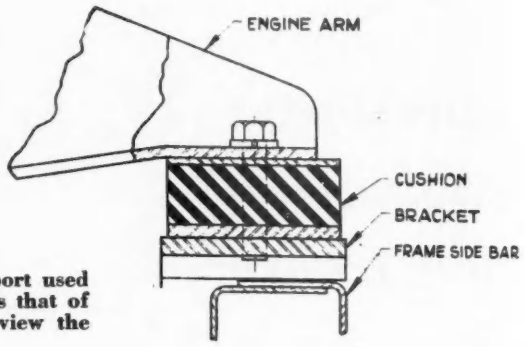
"jiggle-pin"-controlled orifice for bleeding air; a new engine mounting consisting of two front supports with crankcase brackets bolted to rubber pads on the frame, and one support under the transmission extension.

All V-8 engines have the same outside dimensions, the blocks and heads being alike, except for the cylinder bores. The generator now is mounted between the blocks and is driven by a V-belt which also drives the water pump. The fan also is mounted independently and is driven by a separate V-belt.

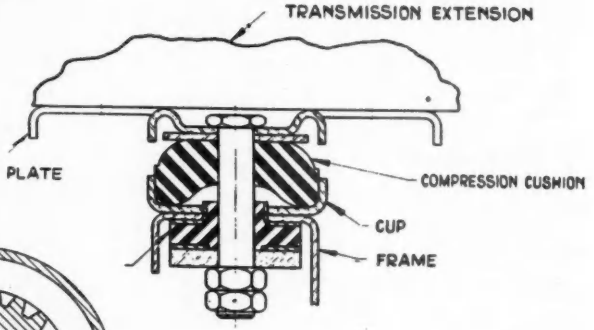
The rear support is of a new type in which the rubber is under both shear and compression. The effect is to allow free movement of the engine through a limited range, beyond which the resistance builds up rapidly, preventing excessive shaking of the engine in the chassis at high speeds or over rough roads.

Chokes now are fully automatic, the manual control feature of the former triple range choke being discontinued. The electric choke mechanism remains substantially the same.

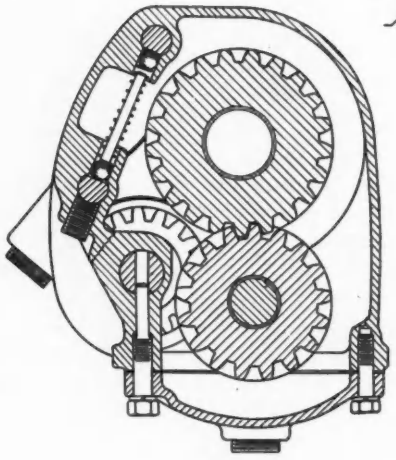
In the valve silencers, the reservoirs on the tappet brackets have been eliminated, and the oil now passes directly to the tappet body through a longitudinal drill hole in the tappet guide. A Handy oil filter now cleans all oil passing to the hydraulic valve silencers, and not only prevents interference with valve-silencer action by dirt, but acts as an air trap. An additional safeguard against air becoming trapped in the tappet bodies are "jiggle pins," of which one is placed in each of the valve guide castings. This pin fits within a hole connected with the tappet oil-supply passage in the tappet guide with a clearance of .006-.010. in. and permits oil to leak at a continuous, low rate, as well as any air present to be "bled."

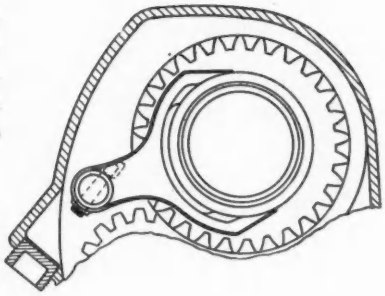


Details of the engine support used on the V-8. Upper view is that of the front and the lower view the rear support



Transverse section of transmission, showing location of slider bars, oil-filler opening and cover plate (below)

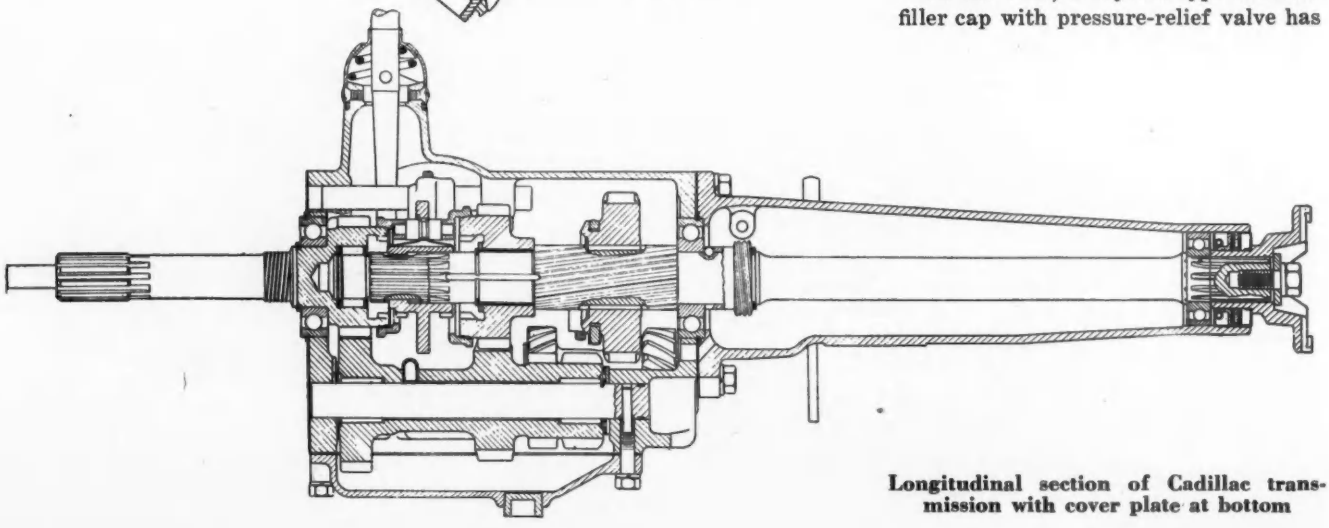




Oil-bath air cleaners are standard on all engines except the V-16. Changes have been made in the big end of the V-8 connecting rods to increase stiffness of both the shank and the bearing backing. The weight of the rod has been slightly reduced.

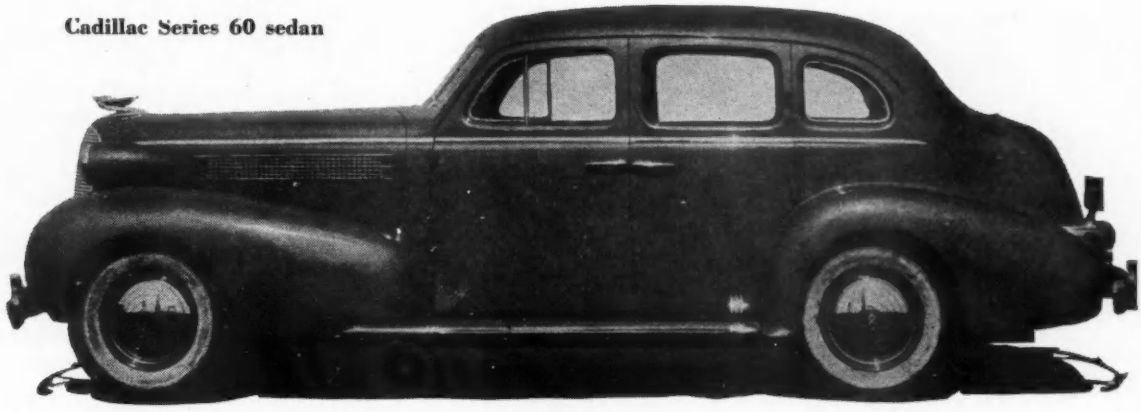
Exhaust systems on Series 50 and 60 are new. A single large muffler is used (instead of two mufflers). A novel tail-pipe end (see illustration) permits the exhaust gases to expand and to escape in a thin sheath around the periphery of the pipe. The tail-pipe end is porcelain-enameled. Exhaust systems of all models include new tail-pipe-mounting brackets which permit the pipes and mufflers to slide endwise as the system expands and contracts.

On the V-16, a bayonet-type radiator filler cap with pressure-relief valve has



Longitudinal section of Cadillac transmission with cover plate at bottom

Cadillac Series 60 sedan



been added and a Handy oil filter has replaced the one previously used. Spark plugs on the V-12 and V-16 are 18mm.; on the V-8's, 14mm.

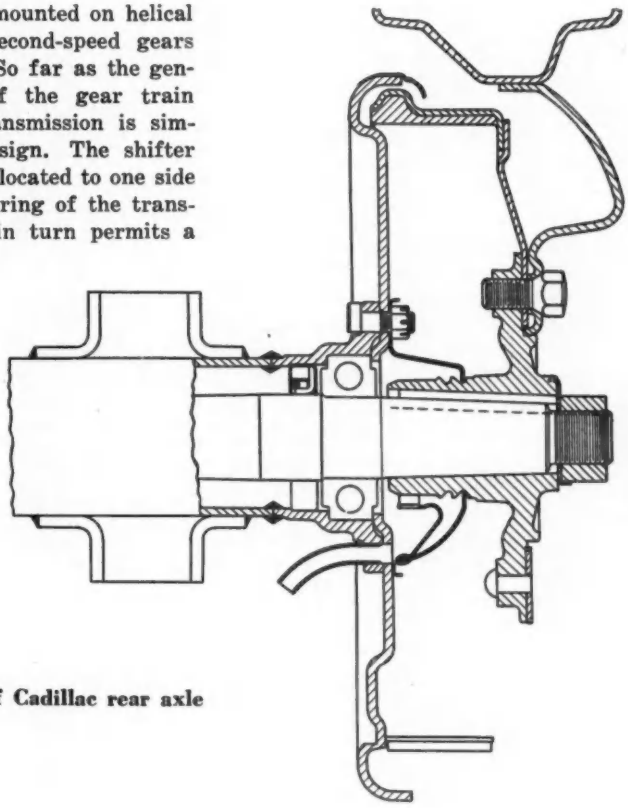
Chassis Details:

Rear stabilizers on the Series 50 and 60 are of a new type consisting of a cross link interconnecting rear axle and frame.

Frames of Cadillacs series 50 and 60 are similar in design, both having I-section X-members. Frames of the larger Cadillacs remain substantially the same.

Series 50 and 60 have a hypoid final drive gear which differs in a number of details from previous designs. The differential carrier is more heavily ribbed. Endwise adjustment is by shims instead of by a threaded sleeve. The differential bearings are of the roller type, as before. There are now aluminum-bronze thrust washers back of the two differential pinions, and the size of the axle shaft at the hub has been increased.

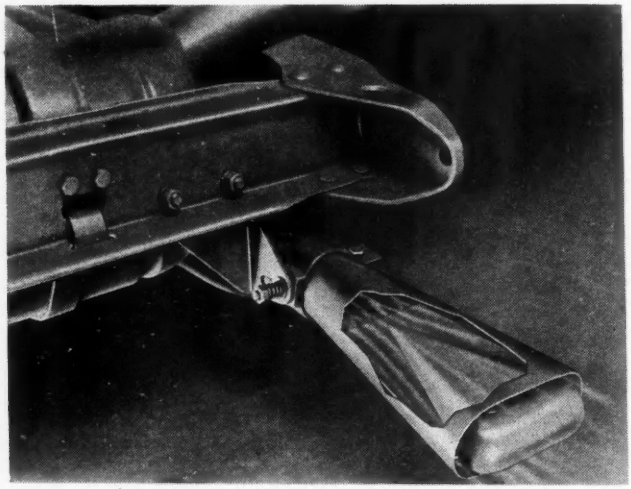
A new transmission with all-helical gears is used interchangeably on all models. It is said to be more durable than the former unit, although 84 lb. lighter. The low and reverse gears are of the sliding type, mounted on helical splines, while the second-speed gears are constant mesh. So far as the general arrangement of the gear train is concerned the transmission is similar to the 36-60 design. The shifter shafts, however, are located to one side thus permitting lowering of the transmission top, which in turn permits a



Wheel end of Cadillac rear axle

Chassis Details

	SERIES	WHEEL-BASE		ENGINE	BODY MODELS	APPROXIMATE CURB WEIGHTS
La Salle	50	124	V-8	322 cu. in.	5 Fisher	3960
Cadillac	60	124	V-8	346 cu. in.	4 Fisher	3960
"	65	131	V-8	346 cu. in.	1 Fisher	4600
"	70	131	V-8	346 cu. in.	4 Fleetwood	4600
"	75	138	V-8	346 cu. in.	7 Fleetwood	5015
"	85	138	V-12	368 cu. in.	7 Fleetwood	5300
"	90	154	V-16	452 cu. in.	2 Fleetwood	



Porcelain - enameled exhaust tail pipe, which gives a sheath-form of exhaust blast

lower front-compartment floor. The transmission cover is now on the bottom. The new transmission is 2 9/16 in. shorter. The gear diameters are also reduced, which decreases the tooth speeds, giving easy shifting and reduced wear.

A new pin-type synchronizer has been developed by Cadillac. It operates on the same principle as the inertia synchronizer formerly used on the 36-60 transmission. The cam action essential to the inertia type synchronizer is secured in the new design by three pins passing through holes in a flange on the sliding clutch member. Each of these pins is tapered and forms a cam surface which contacts with the hole through which it passes, giving the desired inertia action.

Two sizes of Long clutches are used, one on the LaSalle, the other on the Cadillac. The clutch-throwout bearing buttons are now hardened.

Rear axles of Series 50, 60, 65 and 70 are lighter. Front shock-absorber yokes on Series 37-65, 70, 75, and 85 have been redesigned to permit greater rebound spring travel.

On Series 50 and 60 the leaves of the rear springs are separated by liners impregnated with an anti-friction material, which obviates the need for spring lubrication. Another advantage of the new design is a 10 per cent weight reduction. No spring covers are used with this type of spring. On Series 65, 70, 75, and 85 spring covers and graphite grease lubrication are continued. On Series 50 and 60 both shackle pins and the spring bolt at the front of the spring are threaded. On Series 65, 70, 75, and 85 both shackle bolts are threaded, the front spring eye bolt being rubber-bushed.

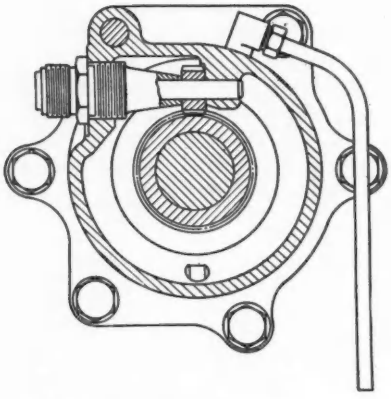
Fixed type 1½-in., end-to-end discharge shock absorbers are used on Series 50 and 60 at front and rear. Series 65, 70, 75, and 85 employ 1¾-in. end-to-end discharge shock absorbers. These models have rear shock absorbers with clicker adjustment and with dashpot inertia controls. Series 50 and 60 shock-absorber links employ rubber bushings at both ends. On the larger models a simplified half-ball and socket joint is used.

Molded linings are now used on both the primary and secondary brake shoes on all models except the V-16. On the Series 50 and 60 the width of the front brake drums has been increased from 2 to 2¼ in., thus increasing the brake area from 207 to 220 sq. in. Series 65 and 70 brakes are identical with the 50 and 60.

The propeller shaft adopted this year features a novel slip joint. Splines are formed on the inside of a tube which is pressed into a second tube that is equal in diameter to the propeller shaft proper, and the splined and shaft tubes are welded together. The spline diameter has been increased from 1¼ to 1 13/16 in. This new construction is not only stronger but also 2 lb. lighter.

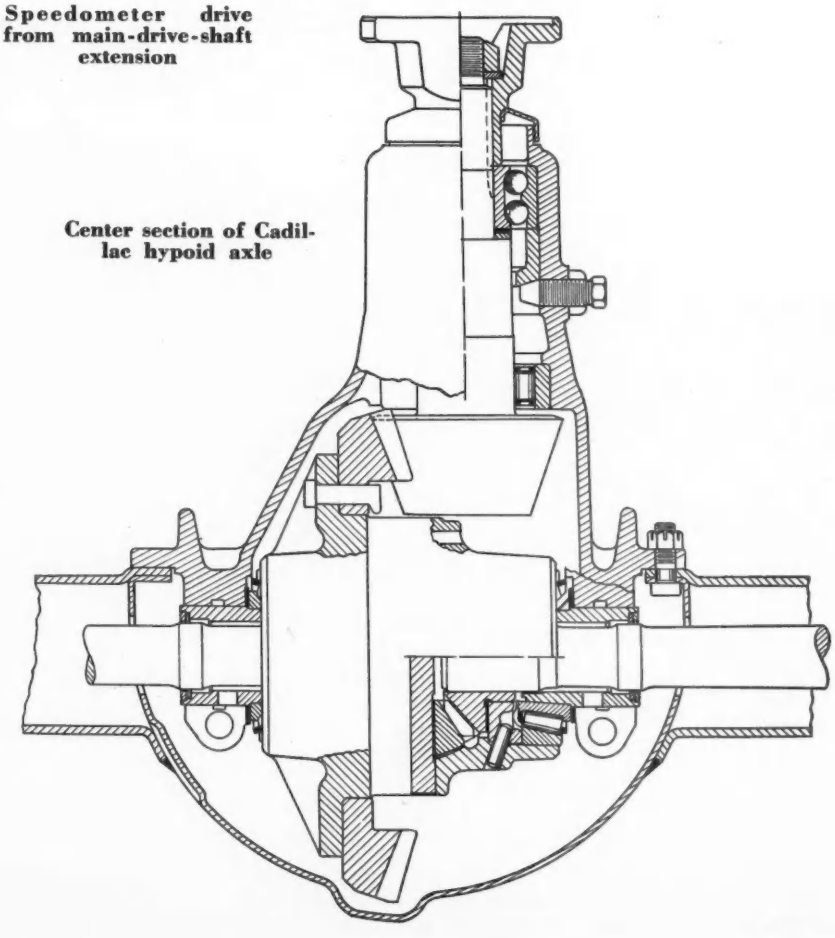
New steering gears with a straddle-mounted steering-arm shaft are used on Series 50, 60, 65, and 70. Steering-gear adjustment is simplified by the use of an eccentric bushing around the

(Turn to page 656, please)



Speedometer drive from main-drive-shaft extension

Center section of Cadillac hypoid axle



Present Volume Achieved by Financing

(Continued from page 603)

esting to observe how closely these two curves coincide. As a matter of cold figures, total financing was 84.4 per cent of retail value in 1932, and has increased each year until it amounts to 114.2 per cent for the first eight months of 1936. The figures for each year are given in the following table:

	Total Financing	Retail Values of all new vehicle Registrations	Financing per cent of Retail Values
1932	$835.9*	$990.2*	84.4
1933	1,127.4	1,223.6	92.1
1934	1,800.5	1,718.9	104.7
1935	2,561.0	2,419.7	105.8
8 mos. 1936	2,471.2	2,164.2	114.2

*Denotes millions of dollars sales.

NOTE: In the above table, the retail values are arrived at by applying to the number of new cars registered the average wholesale value, increased by 40 per cent, giving a 28½ per cent margin to cover the dealers' profit, freight, etc.

Values and Amounts Financed

	Wholesale			Retail		
	Value	Amt. Fin.	Per Cent Financed	Value	Amt. Fin.	Per Cent Financed
1932	$554	$264	48	$776	$237	31
1933	497	287	58	696	222	32
1934	536	372	69	750	256	34
1935	531	388	73	743	226	30
8 mos., est., 1936	530	421	79	742	273	37

In the table below, total financing is broken down into its constituent parts, retail financing of both new and used cars, and wholesale. The growth of wholesale in comparison with total retail is particularly noticeable:

Average and wholesale vehicle values, on a per vehicle basis, considered with the amounts financed and the per cent financed, compared with vehicle value, are represented in the table above.

The above table averages all cars sold, whether or not they were financed. The average amounts of the notes purchased on cars sold at retail were as follows:

	New Cars	Used Cars
1932	$546	$241
1933	516	220
1934	551	226
1935	550	237
8 mos., 1936	576	255

So, with the finance companies supplying each year, through the medium of retail financing of new and used cars, and wholesale financing, substantially more money than the entire retail value of new cars sold, it is evident that they are indeed an essential part of the automobile industry, and can claim credit as a powerful and indispensable factor in the industry's remarkable contributions to the return of prosperity.

Total Car Financing

	Retail				
	New Cars	Used Cars	Total	Wholesale	Grand Total
1932	$303.1*	$232.5*	$535.6*	$330.3*	$835.9*
1933	391.9	235.4	627.3	500.1	1,127.4
1934	586.6	306.6	893.2	907.3	1,800.5
1935	734.1	424.3	1,158.4	1,402.6	2,561.0
8 mos., 1936	795.2	424.3	1,219.5	1,251.7	2,471.2
Estimate, 1936	1,146.4	586.5	1,732.9	1,769.6	3,502.5

* Denotes millions of dollar sales.

Henry le Chatelier

M. Henry le Chatelier the great French chemist and metallurgist, died at his home in Miribel-les-Echelles, France, on Sept. 17 at the age of 86 years. He studied at the Ecole Polytechnique and the Ecole des Mines, at which latter institution he became professor of chemistry at the age of 27. A good many metallurgical instruments, such as metallurgical microscopes, thermo-electric and optical pyrometers, were invented by him. He was the author of several books on fuels and metallurgical subjects and in 1903 founded the periodical *La Revue de Métallurgie*, which has become a leading publication in its field. In 1931, an international committee was organized to commemorate the 50th anniversary of his graduation from the Ecole Polytechnique in a fitting way, and a fund was started which grew to 170,000 francs. A special medal was struck and presented to M. le Chatelier and at his request the sum of 100,000 francs from the fund was presented to the Academy of Sciences for the creation of a research fund.

Two views of the "Miami Queen," recently completed by its designer and owner, Louis Nuta, of Miami, Fla. The boat is powered with two 12-cylinder engines, has a new type "V" belt dual roll drive and develops 90 hp. A speed of 130 m.p.h. is hoped for by its owner, who will try to break Gar Wood's record of 124.86 m.p.h. on the Indian River in December

International News photo

Oldsmobile Eight coupe, with two auxiliary seats behind driver's seat

Oldsmobile Engines for

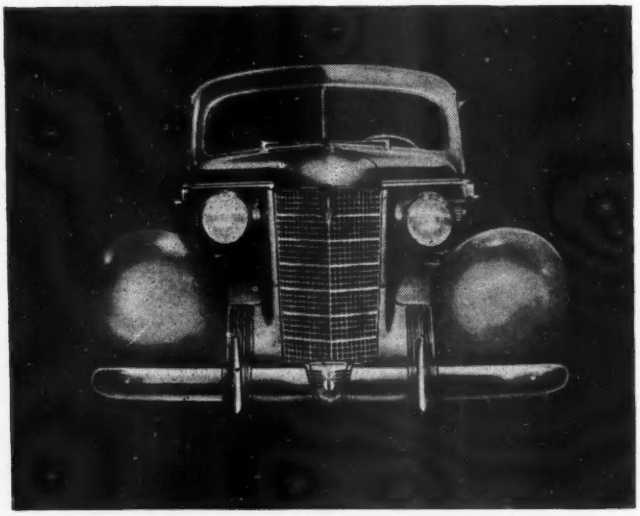
OLDSMOBILE continues its two lines of cars, the Six and the Eight, but this year the two lines will be easily distinguishable because of differences in body styling. The cars are longer, lower, roomier and more comfortable, and their engines have a greater reserve of power at lower speeds, with resulting improvements in performance and operating economy. The Six engine now is rated 95 instead of 90 hp., while the Eight is rated 110 instead of 100 hp. The wheelbase of the Six has been increased from 115 to 117 in. and that of the Eight from 121 to 124 in.

On the Six there is a radiator grille of an entirely new design, composed of eight die-cast horizontal grille louvers, which are chromium-plated and deeply recessed. Below these are three smaller louvers, slightly inclined on opposite sides of the central Oldsmobile emblem. Hood louvers are of the triple horizontal bar design, which harmonizes with the radiator grille. The streamlined headlamps are supported directly from the hood sides.

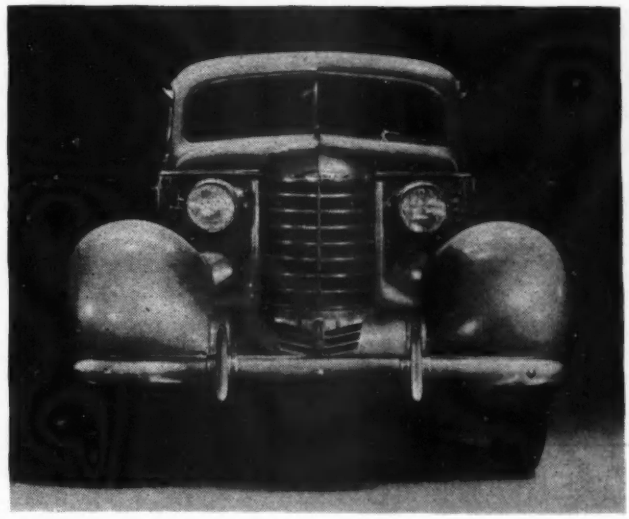
Equally distinctive in design is the grille on the Eight. It is a die-cast unit of square-mesh design, chromium-plated and outlined by a chromium trim molding which blends into the hood at the top of the grille. A narrow medallion extends down from the radiator shell at the top center of the grille. Deep balanced front and rear fenders, massive chromium-plated bumpers and bumper guards, running boards covered with ribbed molded rubber, and steel wheels with large-diameter, chromium-plated hub caps are other features of both the Six and the Eight.

There are combination tail and stop lights at the rear of all bodies, located high up where the body molding terminates. However, the rear lights of the two lines are entirely different in style. Whereas those of the Six are sharply streamlined, those of the Eight are of a modernistic design, with both rear and side panels of red glass, the latter serving as a warning signal to cross traffic. License plate brackets are located at the center of the rear-compartment lid, and separate license-plate lights are provided. These units also are of somewhat different design on each of the two lines.

Each line now comprises the following seven body styles: two-door sedan, two-door touring sedan with trunk, four-door sedan, four-door touring sedan with trunk, business coupe, convertible coupe and—a newcomer—the club coupe, which replaces the former sport coupe. The club coupe is a five-window model and is provided with a pair of auxiliary seats behind the driver's seat for the convenience of occasional passengers. When not in use these auxiliary seats may be folded into the rear body recesses, thereby adding 22 cu. ft. to the luggage space.



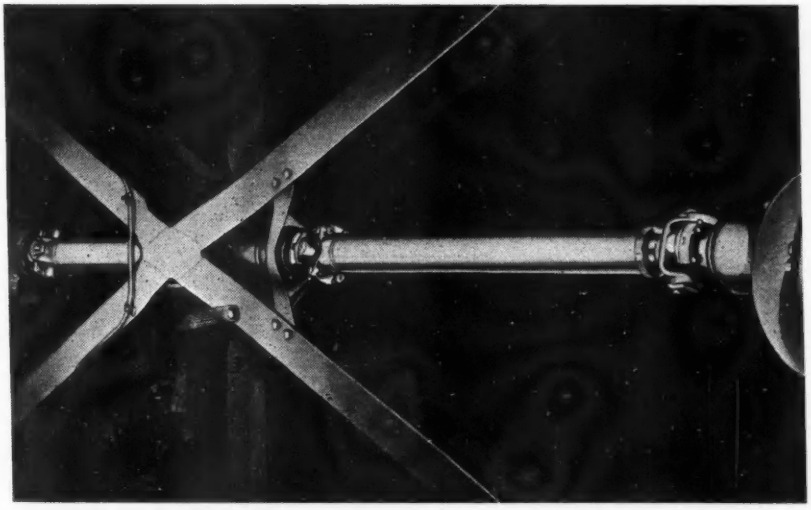
Front view of Oldsmobile Eight



Front view of Oldsmobile Six

Luggage space has been materially increased on all body models, as a result of increases in body lengths made possible by the increase in wheelbase lengths, and also as a result of the lowering of the body floors by 3½ in., which give added depth to the bodies. By making the propeller shaft in two sections and providing it with three instead of two universal joints, it has been possible to lower the car floors materially without resorting to the use of rear-compartment tunnels The added center universal joint is supported by the I-section X-members of the frame. This lowering of the floor also added to the head room and leg room without increasing the overall height of the cars. Another advantage derived from the lowering of the floors is a lower center of gravity and consequent increased stability.

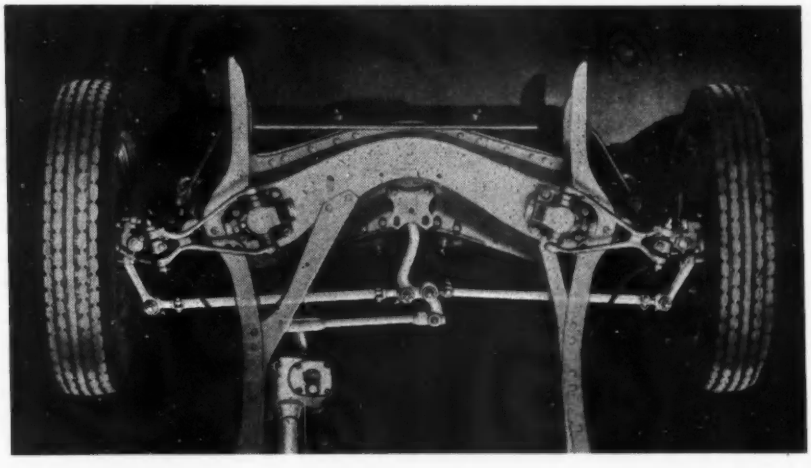
1937 Have More Power



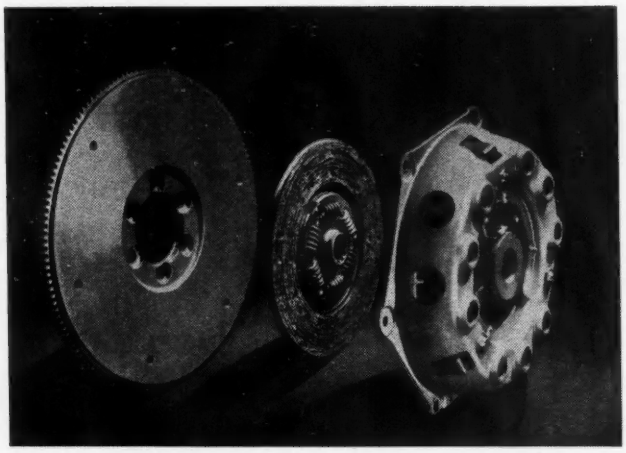
Two-section propeller shaft with intermediate support on frame X member

Seats in all bodies have been moved forward approximately 6 in., and the rear passengers are now seated ahead of the rear axle, which improves the rear-seat ride. Front seats are adjustable in such a way that when the seat is moved forward, the rear of the seat cushion rises and the back cushion tilts forward, affording comfortable support and maintaining the line of vision at the proper level. At the same time, the front edge of the seat is lowered somewhat, eliminating the need of uncomfortably bending the knees in order to reach the pedals. A spring unit is included in the front-seat assembly to assist in moving it forward.

Unisteel, turret-top bodies by Fisher for 1937 have a heavy structural frame or inner steel skeleton, all-steel floors



Front-end of chassis seen from underneath, showing the transverse steering drag link, the independent suspension by coil springs, the shock absorbers and front-end stabilizer



Clutch driven members now have a spiral-wound facing

and girder-type steel doors. All doors and windows are sealed against wind and rain by rubber windlacing. Safety glass is standard throughout. Closed bodies are equipped with the Oldsmobile-Fisher adjustable ventilators. Seats have pillow-type upholstery and are sufficiently wide to comfortably accommodate three passengers each.

The instrument panel carries two large dials on each side of a central louvered panel intended to accommodate a radio speaker. Radio aerials are molded into the running boards. The two dials on the right of the instrument panel are inset into the door of a package compartment with tumbler lock. One of these dials conceals an ash tray, The other is a decorative medallion which may be replaced by an illuminated electric clock available as an extra. Installation of the clock includes a small light which illuminates the parcel compartment when the door is opened. Provision is made for the installation of twin defrosters.

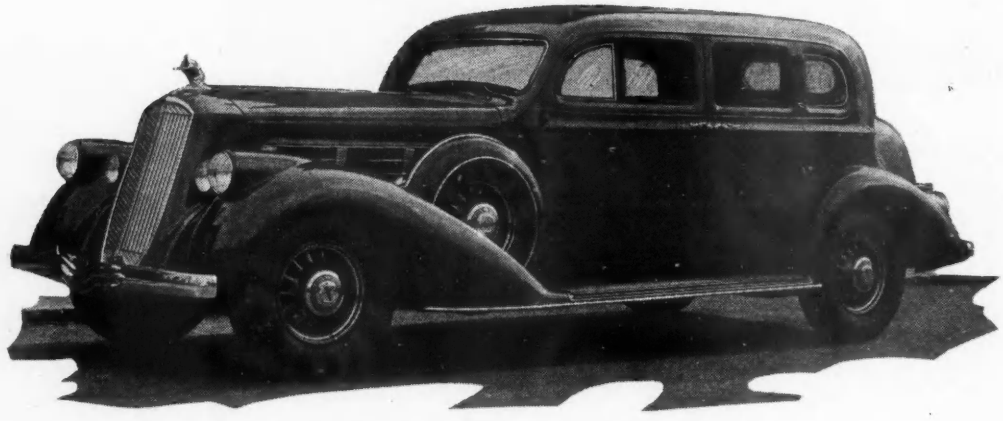
An appreciable improvement in fuel economy is claimed for the 1937 Oldsmobile, due to improvements in the carburetor and manifold systems. In the new powerplants the operation of the choke, the spark advance, idling speed, and the temperature of the fuel mixture are controlled automatically. Both engines are three-point mounted in rubber.

The six-cylinder engine now has cylinder dimensions of 3 7/16 by 4⅛ in. (an increase of ⅛ in. in bore) and the displacement has been increased from 213.3 to 229.7 cu. in. The eight-cylinder engine now has cylinder dimensions of 3¼ by 3⅞ in. (an increase of ¼ in. in bore and a decrease of ¼ in. in stroke) and the displacement has been increased from 240.3 to 257.1 cu. in. Compression ratios are 6.1 for the Six and 6.2 for the Eight. Engine blocks are cast integral with the crankcase and provide full-length water jackets for the cylinders. Direct "pipe-line" cooling is provided for the exhaust valves.

Independent front-wheel suspension is continued. Center-control steering is employed on both cars, as are two-way shock absorbers and dual (front and rear) ride stabilizers. The hydraulic brakes are now triple-sealed. Both cars have two distinct braking systems, the "pistol-grip" lever of the emergency brake being located under the dash at the left of the driver.

Other mechanical improvements include a sturdier rear-axle construction, larger wheel bearings at both front and rear, an improved valve design, and the use of spiral clutch facings which are claimed to make engagement smoother and to add to clutch life.

Pierce Arrow for 1937



Pierce Arrow five-passenger custom sedan

PIERCE ARROW for 1937 continues its eight-cylinder line in two wheelbase lengths, 139 and 144 in., and its two twelve-cylinder lines in wheelbase lengths of 139 and 144 in. and 147 in. respectively. In addition to the standard body styles, five new custom bodies are being offered. A new five-passenger custom sedan is being introduced for the eight- and twelve-cylinder chassis of 144-in. wheelbase. Since the wheelbase is longer than that of the standard five-passenger sedan, the rear compartment is roomier. A new formal sedan with leather top and rear quarters and with extra seats in the rear compartment is also being offered for these same chassis. The twelve-cylinder chassis of 147-in. wheelbase now comes also with a town-car body by Pierce Arrow. A Brunn Metropolitan town brougham is available on the two chassis of 144-in. wheelbase.

AUTOMOTIVE INDUSTRIES

Newark Truck Show

Trend to Cab-Over-Engine Jobs Evident Among 64 Exhibits

Well over a million dollars worth of motor trucks, engines and accessories was exhibited to the public at the 1936 National Motor Truck Show which was held at the Center Market Building in Newark, N. J., and formally opened on Tuesday morning, Nov. 3. Sixty-four exhibitors, almost a 50 per cent increase over the number showing last year, displayed their products at this third annual show conducted by the New Jersey Motor Truck Association cooperating with the S.A.E., the Newark Chamber of Commerce and the New Jersey Highway Users Conference.

If the number of models displayed is indicative of a trend, there is a definite movement to the cab-over-engine jobs, even in the lighter trucks.

While no definite figures on attendance are available, the exhibitors seemed well pleased with the interest evidenced by the number of persons attracted to the show. In conjunction with the 1936 Motor Truck Show, a regional transportation and maintenance meeting, sponsored by the S.A.E. groups mentioned, convened at the Robert Treat Hotel, Newark, on Wednesday afternoon, Nov. 4, for the first of a series of technical paper presentations and discussions.

New Ethyl Option

Octane Ratings of 70 or 73 May Be Used for Regular Grades

Due to the differences in road knock ratings, under variable operating conditions, with gasolines having about the same octane ratings obtained by the C.F.R. Research Method, Ethyl Gasoline Corp. has just offered all its oil company licensees a new option which is said to ensure substantially equal average road performance of all types of fuels under the usual range of atmospheric conditions.

Specifically, the new contract offers refiners the option of making lead-treated regular grades of gasoline either with an octane number or not more than 70 by the C.F.R. Motor Method, or with an octane rating of 73 as representing the mean of the

(Turn to page 641, please)

George W. Mason
President of the Kelvinator Corp., who is expected to become president of Nash Motors when the merger of the two companies is concluded.

Election Primes Stocks

Automobile stocks were among the features of strength in the first post-election "inflation" market Wednesday. Led by Chrysler Corp., which scored a wide gain to a new high, the group moved up sharply on the prospects of large year-end dividends and continued improvement in earnings.

Like Chrysler, General Motors has yet to act on a final dividend. This issue, too, made a new high as did Hudson. All three stocks are said to be in line for substantial dividends to be paid out of 1936 earnings. The surtax on undistributed net incomes of corporations is the controlling factor.

Motor accessory stocks were active also, and gained somewhat, but their rallies were not so extensive as those of the car manufacturers' shares. Excepting for Houdaille Hershey, Motor Products, Mullins B and the Timken issues, most of the accessory stocks were up only fractionally. Earnings in this group, too, are trending higher.

Order Bank Mounts

400,000 Output in November Likely, December May Break Records

By Harold E. Gronseth

Working on a substantial accumulation of unfilled orders, motor companies are steadily pushing production into higher ground. With a freer flow of materials from suppliers and rising efficiency on new model production, the plants are now making good headway in operations and a material expansion in the rate of output is expected during the next few weeks.

A November production in excess of 400,000 units is indicated. It may go considerably beyond that figure if Ford operations, now well under way, hit their full stride in the course of the month. The industry's rate of output is fast approaching that of a year ago, when it was farther advanced due to the earlier start on new models. There is a good chance that production this month will overtake that of November last year when 408,550 cars and trucks were built.

December unquestionably will set a new high production mark for that month, exceeding the previous December peak of 418,317 units reached last year when the industry swung over to fall introductions of new models.

Unless the current month's production materially exceeds 400,000 units,

(Turn to page 652, please)

Tire Plans Advance

Ford Placing Huge Equipment Orders, Detroit Hears

Detroit Correspondence

Henry Ford is in earnest. The Ford Motor Co. has definitely entered upon its program to manufacture its own original equipment tires and remove the threat of labor strife which now hangs over the plants of three of the Ford Company's largest tire suppliers —Goodyear, Goodrich and Firestone.

Ford has already placed orders, it is reliably understood, for several million dollars' worth of the latest in rubber mills and in tire building and tire vulcanizing equipment, and a corps of Firestone engineers is busy collaborating with Ford engineers on the design of the new Ford tire. In automo-

(Turn to page 652, please)

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

The upward trend of general business activity that commenced about June, 1935, continued last week. The volume of retail trade was estimated from five to eight per cent above that in the preceding week and from 12 to 18 per cent above that a year ago. Wholesale business was estimated at about 20 per cent above that in the corresponding period last year.

Employment and Production Gain

According to the Board of Governors of the Federal Reserve System, industrial production in September was maintained and factory employment increased seasonally. Retail business turned upward, and the rise was greater than seasonal. There was a further expansion in commercial loans of city banks.

Carloadings Above Last Year's

Railway freight loadings during the week ended Oct. 24 amounted to 815,972 cars, which marks a decline of 10,183 cars below those in the preceding week, a gain of 105,351 cars above those a year ago, and an increase of 191,164 cars above those two years ago.

Power Output Off Slightly

Production of electricity by the electric light and power industry in the United States during the week ended Oct. 24 was slightly below that in the preceding week and was 14.3 per cent above that in the corresponding period last year.

Lumber Output at 68%

Production of lumber during the week ended Oct. 17 was 68 per cent of the 1929 weekly average. New orders continued to surpass output, and shipments were slightly less than new orders.

Farm Prices Lower

There was a moderate decline in farm prices during the month ended Oct. 15. At 121, the index is now 12 points higher than a year ago. The index of prices paid by farmers for the commodities they purchase was 127, which is only four points higher than a year ago.

Fisher's Index

Professor Fisher's index of wholesale commodity prices during the week ended Oct. 31 stood at 84.5, as compared with 84.0 the week before and 83.8 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Oct. 28 showed no changes in holdings of discounted bills, bills bought in the open market, and government securities. Money in circulation declined $9,000,000, and the monetary gold stock increased $23,000,000.

New Federal Trucks

Four Cab-Over-Engine Models, One Milk-Delivery Offered

In addition to its line of conventional truck models the Federal Motor Truck Co. offers four new cab-over-engine models and a new model for milk delivery and similar services. The cab-over-engine trucks are of the following capacities:

Model	Rating	Gross Weight
75	1½-2 ton	11,000 lb.
80	2-3 ton	13,000 "
85	2½-3½ ton	14,500 "
89	3-4 ton	16,500 "

Each of the above is built in wheelbase lengths of 104, 120, 132, 145, and 159 in., the corresponding loading-space lengths being 92, 119, 143, 167 and 191 in. The wheelbase lengths are approximately 3 ft. less than those of conventional trucks of the same capacity, while the loading spaces remain about the same.

The new truck for milk delivery and similar services, known as Model 9, is rated ¾-1 ton, with an allowable gross weight of 7000 lb. It is offered in two wheelbase lengths, 105 and 121 in. This model is powered with a four-cylinder 3⅜ by 4-in. engine (143 cu. in.) which develops 33 hp. Other chassis features include a four-speed transmission, roller-bearing universal joints, Timken front and full-floating rear axles, four-wheel hydraulic brakes, and rubber-bushed spring eyes and shackles. Standard tire equipment is 6.00-20 truck-type balloons on cast-steel wheels.

A body designed for milk delivery and which can be adapted to similar services calling for frequent stops, is furnished by the company in two lengths. That for the short-wheelbase chassis has a capacity of 30 cases of milk; that for the long chassis, 40 cases. Folding doors, a step-well on each side, a swivel seat, and galvanized-steel lining are features of this body.

The short chassis with 30-can milk body sells at $995, the long chassis with 40-case milk body at $1,035. The chassis alone lists at $625 and $695 for the two wheelbase lengths respectively.

Seiver Chairman of NASFC Standard Terms Committee

The National Association of Sales Finance Companies committee on standard terms for automobile financing has been appointed, pursuant to the resolution adopted by the board of directors at their meeting following the annual convention last September. Members of the committee are: L. M. Seiver, president, Automobile Banking Corp., Philadelphia, Pa., chairman; H. G. Snodgrass, president, Mercantile Acceptance Co., San Francisco, Calif.; Clarence L. Landen, vice-president. Securities Investment Corp., Omaha, Neb.; George F. Benkhart, vice-president, General Motors Acceptance Corp., New York City; and A. O. Dietz, president, Commercial Investment Trust, Inc., New York City.

2 New Autocar Chassis

Two Medium Duty Trucks, Models RL and RM, Added to Line

The Autocar Co., Ardmore, Pa., enters the 1937 season with the announcement of the Model RL, a medium-duty chassis which will be priced in the neighborhood of $2,000. The Model RL is rated at 4 to 5 tons with a gross weight rating of 20,000 lb. The Autocar Blue Streak engine with a piston displacement of 358 cu. in. is the power unit. The frame is of 8 15/16 in. heat-treated carbon steel.

The Model RL is slightly lighter, with a tonnage rating of 3½-4½ and a gross weight rating of 18,000 lb. The Blue Streak engine has a displacement of 313 cu. in. and the frame is of 8 1/16 in. heat-treated carbon steel. Both models have Autocar five-speed transmissions, double-reduction rear axles and four-wheel vacuum operated brakes.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

South Bend, Oct. 19, 1896.

Editor *Horseless Age*.

Dear Sir:

Yours 16th inst. to this company, respecting progress made during the past year in the motor-wagon line, has been referred to me. If you refer to the progress made by this company, we are not yet prepared to give to the public what we have accomplished. However, we anticipate, within a very short time to be able to present what we consider, from the standpoint of utility, a practical motor-wagon. . . .

Our Mr. P. E. Studebaker, second vice-president, and also J. M. Studebaker, first vice-president, have both been in England this summer and made careful investigation of the field over there. They report the interest taken by the public as being very general, and that large amounts of capital are being invested in the erection of manufacturing plants and otherwise used for the purpose of developing the horseless vehicle.

Very truly yours,
Fred'k S. Fish, Counsel.

—From a letter written to *The Horseless Age*, November, 1896, by counsel for the Studebaker Bros.

Harold Heath
General manager of Humber, Ltd., and the Hillman Motor Car Co., of Coventry, England, who is at present visiting in the United States

1937 Oldsmobile Prices

Six	1937	1936	Ch'ge
Sedan, 2d	$740	$...	$....
Tour. sedan, trunk, 2d....	765	...	....
Sedan, 4d	790	795	— 5
Tour. sedan, trunk, 4d....	815	820	— 5
Bus. Coupe	685	665	+20
Conv. Coupe	835	805	+30
Club Coupe	740	...	....
Eight			
Sedan, 2d	840	...	....
Tour. sedan, trunk, 2d....	865	...	....
Sedan, 4d	890	910	—20
Tour. sedan, 4d	915	935	—20
Bus. Coupe	785	810	—25
Conv. Coupe	935	935	....
Club Coupe	840	...	....

Gar Wood Applies for Stock Listing in N. Y.

Gar Wood Industries, Inc., has applied for listing of its common capital stock on the New York Stock Exchange. The stock is currently selling in the over-the-counter market at around $15 per share. Until last June, Gar Wood Industries, Inc., was a closed corporation. The company, headed by the famous speed boat pilot, manufactures hoists, winches, air conditioning and domestic heating units and road machinery.

Graham Superchargers Set Records for Durability

One of the most remarkable records for mechanical durability and reliability ever achieved has been disclosed by W. V. DeGalan, service director of the Graham-Paige Motors Corp., when he revealed that not a single working part of any Graham supercharger has ever failed in service or required replacement due to wear.

Now entering their fourth year in regular production, superchargers on many older Graham cars have long ago passed the billion revolutions mark. In explaining the reasons for this unusual record, Floyd F. Kishline, Graham chief engineer said:

"A number of years ago we set out on a development program that would give us a supercharger mechanism that was as foolproof as any mechanism could be made. This meant that for superchargers we had to depart from conventional engineering design practices in many ways.

"Just take the question of gears for instance. While conventional spur or helical gears might have been quite satisfactory we felt we wanted something with even longer inherent life. This was done by developing and adapting a recent discovery—the 'cone' type of worm gear to a supercharger drive.

"These gears have the unusual characteristic of 'wearing in' instead of 'wearing out' in addition to their high efficiency. A second step was the development of a novel internal oiling system for the supercharger mechanism. This is designed so that regular engine oil is used, with a complete and automatic circulation system inside of the supercharger housing."

Reo's New Models

Four-Cylinder Light Trucks Announced; Base Price $555

As the first step in its program of expanding its truck line the Reo Motor Car Co., Lansing, Mich., has developed a new series of ½ and ¾-ton trucks. The base model, known as the Reo Speed Delivery, is equipped with all-steel cab with safety glass throughout, and has a list price of $555, complete with pickup body. It is available with a 4-cylinder Reo Silver Crown engine for economy in multi-stop work, and a six-cylinder Silver Crown for fast highway transportation.

Wheelbases are 114 in. and 120 in., the latter priced slightly higher. The short wheelbase permits a 6-ft. pickup body or a 6-ft. 6-in. panel body, and the longer wheelbase a 7-ft. pickup and a panel 6 in. longer.

The new truck presents a modern, streamlined appearance with its chromium-plated radiator grilles, skirted fenders and individual running boards. Spare wheel and tire with metal cover are mounted on the right side back of the cab door. A 16-gal. gasoline tank is mounted at the rear of the frame. The pick-up bodies have running board steps

(Turn to page 654, please)

Calendar of Coming Events

SHOWS

9th International Automobile Salon, Milan, Italy ..... November
Canadian National Automobile Show, Toronto ..... Nov. 7-14
National Automobile Show, Grand Central Palace, New York ..... Nov. 11-18
Omaha Automobile Show ..... Nov. 11-15
Philadelphia Automobile Show .. Nov. 12-19
Scottish Motor Show, Glasgow .. Nov. 13-21
International Aviation Show, Paris, France ..... Nov. 13-29
Columbus Automobile Show ..... Nov. 14-20
Boston Automobile Show ..... Nov. 14-21
Buffalo Automobile Show ..... Nov. 14-21
Chicago Automobile Show ..... Nov. 14-21
Detroit Automobile Show ..... Nov. 14-21
New Haven Automobile Show ... Nov. 14-21
Indianapolis Automobile Show ... Nov. 14-21
San Francisco Automobile Show .. Nov. 14-21
Washington, D. C., Automobile Show, Nov. 14-21
Cincinnati Automobile Show .... Nov. 15-21
St. Louis Automobile Show ..... Nov. 15-22
Pittsburgh Automobile Show .... Nov. 16-21
Brooklyn Automobile Show ..... Nov. 21-28
Cleveland Automobile Show ..... Nov. 21-28
Montreal Automobile Show ..... Nov. 21-28
Kansas City Automobile Show .. Nov. 21-29
Milwaukee Automobile Show ..... Nov. 21-28
Portland Automobile Show ..... Nov. 22-29
Baltimore Automobile Show. Nov 26-Dec. 5
28th Automobile Salon, Brussels, Belgium ..... Nov. 28-Dec. 9
Peoria Automobile Show .. Nov. 30-Dec. 5
Natl. Exposition of Power & Mechanical Engineering, Biennial Meeting, New York City ..... Nov. 30-Dec. 5
First International Consumers Petroleum Exposition, Convention Hall, Detroit ..... Dec. 5-13
Automotive Service Industries Joint Show, Chicago ..... Dec. 9-13
National Motor Boat Show, New York, Jan. 8-16
Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago ..... Apr. 24-28, 1937

CONVENTIONS AND MEETINGS

American Petroleum Institute, Annual Meeting, Chicago ..... Nov. 9-12
Society of Automotive Engineers Annual Dinner, New York ..... Nov. 12
American Association of Motor Vehicle Administrators, Annual Meeting, Hot Springs, Ark. ..... Nov. 12-14
International Day, National Automobile Show, New York ..... Nov. 16
National Foreign Trade Convention, Chicago ..... Nov. 18-20
16th Annual Meeting, Highway Research Board of the National Research Council, Washington, D. C. .. Nov. 18-20
International Acetylene Assn., 37th Annual Convention, St. Louis, Nov. 18-20
Natl. Industrial Traffic League, Annual Meeting, New York City .... Nov. 19-20
Trailer Coach Manufacturers Association, Annual Convention, Chicago, Nov. 19-20
Tin Can Tourists' Get-Together Meeting, Lake City, Fla. ..... Nov. 22-28
American Society of Mechanical Engineers, Annual Meeting, New York, Nov. 30-Dec. 1
National Standard Parts Association, Annual Convention, Detroit ... Dec. 7-8
Tin Can Tourists' Homecoming, Arcadia, Fla. .... Dec. 28, 1936-Jan. 3, 1937
S.A.E. Annual Meeting, Detroit, Mich., Jan. 11-15, 1937
Tin Can Tourists' Winter Convention, Clearwater, Fla. ..... Jan. 29-Feb. 8, 1937
Tin Can Tourists' Winter Convention, Sarasota, Fla. ..... Feb. 8-14, 1937
International Association for Testing Materials, Second International Congress, London, England, April 19-24, 1937
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee, beginning May 2, 1937

Covered Wagon Sets 20,000 Schedule

Booming Demand for Tourist Trailers Leads to 300% Increase of Production

Setting a sales quota of 20,000 trailers as a minimum for 1937, the Covered Wagon Co., Mt. Clemens, Mich., is out to quadruple its business next year. Exactly 5000 units were turned out during the 1936 model year. Production got under way about the middle of October on the 1937 models which will be introduced at the New York Automobile Show, and are to be displayed at 57 other automobile shows this fall.

A two-day sales convention was held at the factory for distributors Oct. 30 and 31 when the new models were presented and the sales program for the coming year outlined. A. C. Sherman, president, asked distributors for a 300 per cent increase in the dealer organization next year, pointing out the reasonableness of his request in view of the 600 per cent increase made during the past year and the growing public interest in trailers which has "spread like an epidemic throughout the land."

The convention itself reflected the phenomenal growth of the trailer industry and, specifically, the progress made by Covered Wagon, now rounding out its eighth year in business. Confined to distributors, the convention this year was nearly as large as that of a year ago when all the dealers were called in. The Covered Wagon selling organization comprises 84 distributors and 817 dealers, the major part of which has been built up in the last nine months. Orders for 871 trailers were left by the distributors who attended the convention.

Radical changes in chassis and body construction feature the 1937 line which, as in 1936, comprises three models. The chassis is all steel and for the bodies a new material has been developed, called Shermanite. It consists of ply-wood laminated to a light gage, copper bearing steel sheet that resists corrosion. The new material is said to have advantages which neither steel nor ply-wood alone possesses, such as greater tensile strength, greater imperviousness to heat and cold, and resistance to rust. It has better sound proof qualities and is lighter in weight. New models have added roominess and many interior refinements. Warner electric brakes are standard on all models.

The 1937 prices were announced as $545 for the Master; $865 for the De Luxe; and $1,260 for the Custom model; all complete. For the shell, prices are $395, $665, and $970, respectively.

The following dealer discount basis was announced at the sales convention: Sales of 1-3, 22 per cent; 4-6 23 per cent; 7-12, 24 per cent; 13-35, 25 per cent; 36-75, 26 per cent, and 76 and over, 27 per cent. Instead of a base discount of 25 per cent with a 5 per cent overriding for wholesale, as formerly, the distributor's discount will be a straight 30 per cent on all models including shells. In the 1937 contract, the discount on parts will be 50 per cent from list price for distributors and 35 per cent for dealers.

1937 Pontiac Prices

DeLuxe 6

Bus. coupe	$650
Sedan, 2d	695
Sport coupe	720
Tour. sedan, 2d	720
Cabriolet	810
Sedan, 4d	745
Tour. sedan, 4d	770

DeLuxe 8

Bus. coupe	725
Sedan, 2d	760
Sport coupe	780
Tour. sedan, 2d	785
Cabriolet	850
Sedan, 4d	805
Tour. sedan, 4d	830

Jehle Leaves White Motor Co.; Spiller Named Chief Engineer

Appointment of W. R. Spiller as chief engineer of the White Motor Co. was announced Nov. 2 by F. M. Bender, vice-president in charge of operations. Mr. Spiller succeeds F. E. Alborn who recently resigned.

Mr. Spiller received his degree in mechanical engineering at the University of Pennsylvania in 1922 and immediately after graduation joined White. His work in the laboratory earned him the position of assistant research engineer, and he was later named truck engineer. No successor has yet been named to fill Mr. Spiller's former position.

Ferdinand Jehle, a prominent member of the S.A.E., resigned on Nov. 1 from his position as research engineer with the White Motor Co. His successor has not yet been named.

The appointment of Roger J. Soulen as wholesale division manager for White was also announced this week. He succeeds Paul Castner who resigned to become sales manager of Edwards Home-mobile Co., tourist trailer manufacturer of South Bend. Mr. Soulen had been with White for the past nine years.

A. A. LIARDET, general manager of Leyland Motors Ltd., England, sailed for his home Oct. 28 after a visit of several weeks in the United States and Canada. Mr. Liardet expressed his appreciation of the hospitality shown him in this country and extended an invitation to members of the industry to visit his company's plants at Leyland, Lancashire, and Kingston-on-Thames, Surrey.

FEDINAND A. KEIHN has resigned his position as manager of the contract and specification department of the J. G. Brill Co., Philadelphia, to establish his own business in the Rialto Building, San Francisco, representing several prominent manufacturers. Mr. Keihn was associated with Mack Trucks for five years and for the past 12 was with Brill.

JAMES O. MATTHEWS has resigned his position as assistant purchasing director of the Reo Motor Car Co. After a two months' vacation in Florida, he will become associated with a Detroit corporation, Mr. Matthews stated.

D. R. DONALDSON has been appointed factory manager of the Covered Wagon Co. He has been with the company for the past year and was with Murray Body previously.

New Truck Registrations

	Sept. 1936	August 1936	Sept. 1935	Nine Months 1936	Nine Months 1935	Per Cent Change, 9 Mos., 1936 over 1935	Numerical Change, 9 Mos., 1936 over 1935	Per Cent of Total Nine Months 1936	Per Cent of Total Nine Months 1935
Chevrolet	15,589	20,931	13,271	171,497	134,629	+ 27.8	36,868	34.45	33.91
Ford	17,044	16,426	13,715	148,503	145,531	+ 2.0	2,972	29.82	36.65
Dodge	7,957	8,298	5,635	68,026	45,390	+ 50.0	22,636	13.66	11.43
International	6,640	6,314	4,963	54,787	39,933	+ 37.2	14,854	11.00	10.06
G. M. C.	3,209	3,070	1,307	21,115	8,408	+151.0	12,707	4.24	2.12
Diamond T	826	801	529	6,310	5,006	+ 26.1	1,304	1.27	1.26
White	510	503	249	4,173	2,219	+ 88.3	1,954	.84	.56
Reo	521	322	385	3,148	3,865	— 18.5	—717	.63	.97
Mack	424	434	81	2,887	1,101	+162.0	1,786	.58	.28
Studebaker	327	320	167	2,511	1,655	+ 51.7	856	.50	.42
Plymouth	166	253	48	2,253	462	+387.0	1,791	.45	.12
Federal	244	251	196	2,206	1,562	+ 41.0	644	.44	.39
Willys-Overland	251	218	254	1,881	1,663	+ 13.3	218	.38	.42
Terraplane	141	204	65	1,602	576	+178.0	1,026	.32	.14
Brockway	138	163	106	1,301	889	+ 46.4	412	.26	.22
Indiana	135	132	101	1,251	465	+169.0	786	.25	.12
Stewart	141	126	90	960	596	+ 61.0	364	.19	.15
Autocar	124	139	75	946	663	+ 42.9	283	.19	.17
Divco	63	65	27	752	252	+198.0	500	.15	.06
F. W. D.	13	26	16	265	154	+ 72.1	111	.05	.04
Sterling	17	39	9	172	123	+ 39.9	49	.03	.03
Twin Coach	3	2	11	87	108	— 19.5	—21	.02	.03
Miscellaneous	128	185	90	1,377	1,801	— 23.5	—424	.28	.45
Total	54,611	59,222	41,390	498,010	397,051	+ 25.3	100,959	100.00	100.00

New Ethyl Option

(Continued from page 637)

Motor Method and a new "Low Temperature Method" just developed by Ethyl. It must not be inferred that this option will have the effect of increasing the level of regular gasoline rating. Rather it should be interpreted as having the effect of raising the average level of regular gasoline rating by improving "poor" gasolines.

It is said to be a demonstrated fact that road knock ratings made on the average 1936 car at high atmospheric temperatures correlate, on the average, with the C.F.R. "Motor Method" rating. On the other hand, road ratings made at low atmospheric temperatures correlate more closely with the C.F.R. "Research Method" which gives a higher octane rating, in many cases, than the Motor Method for the same gasoline. However, road ratings made at intermediate atmospheric temperatures correlate with the mean of the Motor and Research Method ratings.

From a car manufacturers' point of view the change in rating is very significant because the new laboratory method will permit the fuels which have had low road knock ratings to be substantially improved.

The new low temperature method of rating gasolines is offered as an improvement over the present C.F.R. Research Method. Further attention is being given to the development of a universal test method which would give results, by a single test rating, substantially equal to the mean of the Motor and Research ratings. It will be of interest to note that the low temperature method makes use of the standard C.F.R. equipment with just minor modifications.

Henry Ford (right) and Orville Wright visit the house in Dayton where the air pioneer was born. Mr. Ford plans to purchase the house and to remove it to Greenfield Village where it will join other famous relics of American history.

International News photo

:SLANTS:

DIESEL GAINS IN FRANCE—*Of the estimated half-million trucks now being operated in France, approximately 20 per cent of the 2½-ton camions are equipped with Diesel engines, 35 per cent of the 3-ton and 95 per cent of those rating 5 tons or more. The high cost of gasoline is mostly responsible for the increasing use of Diesels, operation of a truck using oil being considerably less than half that of the gasoline vehicle. There is also a growing demand for Diesel engines to replace the gasoline powerplants formerly used in high-speed rail cars, according to a report received by the Commerce Department. Several French companies are studying Diesels for use in aviation, but so far none are being manufactured.*

TURN-TABLE SHOWROOM—*Unique feature of Chrysler's "Most Modern Showroom," opened in the Chrysler Building, New York, Nov. 7, is the revolving circular floor for display of Chrysler-made cars. The new salon occupies over 5000 sq. ft. of space on the first floor and 15,000 on the second. The turn-table is 51 ft. in diameter, set flush with the floor, and moves silently on roller bearings around a stationary island. Five cars can be displayed on the moving floor, with each passing in front of the "invisible glass" windows four times an hour.*

MORE GAS BURNED—*Daily average gasoline consumption was up 6.32 per cent last August over the same month of 1935, according to figures of the American Petroleum Institute. For the first eight months this year, the daily average was 9.29 per cent higher than last year. For August, 1936, the consumption was 1,886,424,000 gal., an increase of 112,128,000 gal., and for the eight-month period, it was 12,807,349,000 gal., an increase of 1,136,464,000 gal.*

Willys-Overland Sells Elyria Plant to Bender

Willys-Overland Motors, Inc., has turned out 100 cars this week for display at shows. The plant now has 1500 workers employed and plans are to make 1200 units this month and 5000 cars in December, according to David R. Wilson, president. The former Elyria, Ohio, plant where the Falcon-Knight was manufactured has been sold to the Bender Body Co., Cleveland, for $100,000 by the Willys-Overland Branches, Inc., subsidiary of Willys-Overland Realization Corp. The Delaware corporation headed by H. J. Leonard, president, now controls 90 properties which it is liquidating. Office buildings in Kansas City and Minneapolis are among properties.

1937 Cadillac Prices

V8—Series 60

Sport coupe	$1445
Tour. sedan	1545
Conv. coupe	1575
Conv. sedan	1885

Series 65

Tour. sedan	1945

Series 70

Sport coupe	2645
Tour. sedan	2445
Conv. coupe	2745
Conv. sedan	2795

Series 75

Tour. sedan, 5-pass.	2645
Tour. sedan, 7-pass.	2795
Imp. tour. sedan, 7-pass.	2995
Town sedan, 5-pass.	3145
Formal sedan, 5-pass.	3495
Conv. sedan, 5-pass.	3445
Town car, 5-pass.	4545

V12—Series 85

Tour. sedan, 5-pass.	3345
Tour. sedan, 7-pass.	3495
Imp. tour. sedan, 7-pass.	3695
Town sedan, 5-pass.	3845
Formal sedan, 5-pass.	4195
Conv. sedan, 5-pass.	4145
Town car, 7-pass.	5245

V16—Series 90

Sedan, 7-pass.	7350
Imp. sedan, 7-pass.	7550

1937 La Salle Prices

Sport coupe	$995
Tour. sedan	1145
Tour. sedan	1195
Conv. coupe	1175
Conv. sedan	1485

Tire Makers Keep Pace With Automobile Progress

(Continued from page 609)

tious problem today facing car manufacturers. They have admonished their Akron sources of supply that they must have *safe* sources of supply outside of Akron.

Under the virtual mandate of the automobile industry, the Akron tire industry is well started on a decentralization program. Goodyear, one of the major suppliers of original equipment tires, has established practically 30,000 daily tire capacity outside of Akron. Goodrich and Firestone have transferred much equipment to their California subsidiaries. Goodrich has equipped a new plant at Oaks, Pa. These three companies collectively are furnishing car manufacturers with more than 16,000,000 tires this year and in addition are supplying the bulk of the 29,000,000-tire replacement market.

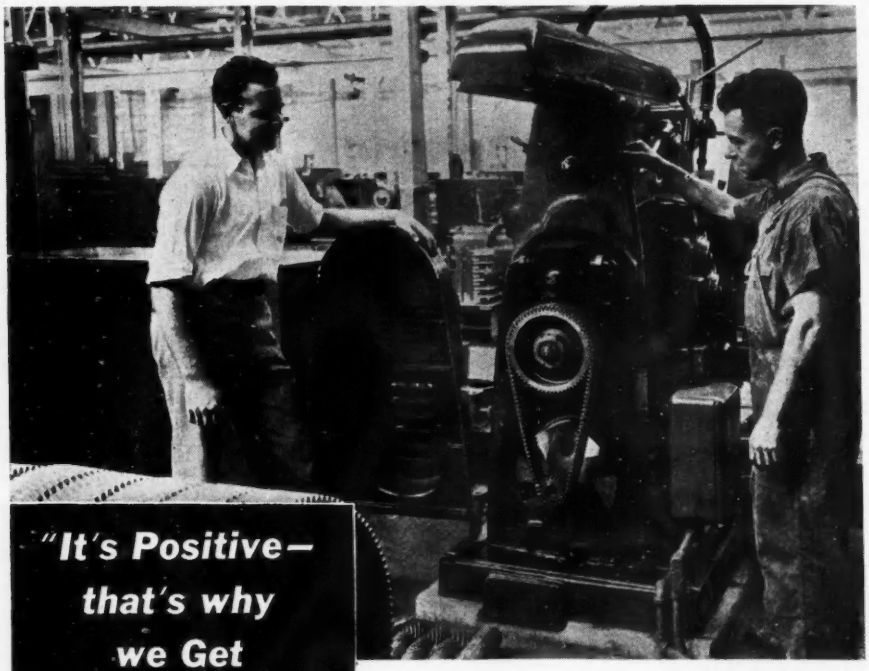
So dark is the labor cloud on Akron's horizon that automobile manufacturers are considering the production of their own original equipment tires. The Ford Motor Co. has summoned tire building equipment experts to Detroit and obtained estimates on specifications for approximately $10,000,000 worth of tire building equipment and machinery. Chrysler probably will be next to make such a move. But equipment plants are so loaded now with orders from Akron tire companies for machinery to ship to their plants outside of Akron, that Henry Ford probably will have to wait a good many months for his equipment.

The Ford plans call eventually for a plant that will produce 24,000 tires per day on a three 8-hour shift basis. And these plans also call for, it is understood, a cooperative endeavor with Firestone Tire & Rubber Co. It is no secret that Firestone experts right now are in Detroit assisting in the design of the new Ford tire, and that Firestone will, to a large extent, participate in the Ford tire activities in Detroit. In other words Ford's tire building program may be considered to be at least a quasi Firestone decentralization move.

Entry of car manufacturers into the tire business would inject many marketing problems into the replacement market. For years tire manufacturers have taken the original equipment business at cost, or at a loss (for several years they recovered only 87 to 90 cents on every dollar of cost on tires shipped to Detroit), because their tires on new cars automatically projected them into the consumer renewal market, for a majority of motorists usually buy for replacements the same brand of tires with which their cars were originally equipped. But what if a Ford tire is put on the market? Will all Ford and other dealers have to stock Ford replacement tires? And will Ford have to get into the secondary market as well as the primary market? Perhaps only time can answer these questions.

Suffice it to say that the automotive industry, which in 1937 will require at least 22,000,000 tires for original equipment—the largest number on record (previous peak 20,957,000 in 1929), is not going to flirt with Akron labor trouble and is going to be insured of safe sources of supply no matter what the cost.

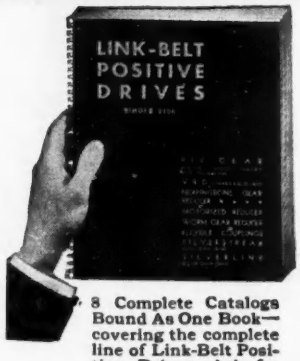
Second—there's the revolution in tire marketing produced by the new Robinson-Patman Act plus the threat of a further revolution if the proposed new Patman Act becomes Federal law and bars manufacturers from the retail



"It's Positive—that's why we Get Top Production"

● This Cincinnati Double Head Miller is driven by a Link-Belt Silent Chain Drive. Through its smooth, steady transmission of all of the power of the motor to the machine, it assures a uniformity of work not possible with drives that slip; and its uniformly positive action serves to maintain production at a pre-determined rate.

Because of these inherent characteristics and because it lasts longer, maintains its high initial efficiency throughout its entire life, requires little attention and practically no upkeep expense, the Link-Belt Silent Chain Drive is truly a cost-reducing power transmitter. Address Link-Belt Company, Indianapolis, Philadelphia, Chicago, San Francisco, Toronto, or any of our offices in principal cities. Send for catalogs. Detroit Warehouse . . . 5938 Linsdale Avenue.



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LINK-BELT ★Silverstreak Silent Chain Drive

★ T. M. REG. U. S. PAT. OFF.

LINK-BELT POSITIVE DRIVES INCLUDE: 5821-A

business. Under the Robinson-Patman Act which became Federal law June 16 two of the tire industry's major cost-plus private brand mass distributor tire contracts have been dumped overboard. First to surrender to the new law which bans price discrimination, was the hundred-million-dollar, 10-year-old Goodyear-Sears Roebuck contract. Second repercussion to the new law came just recently when Goodrich terminated its contract to make half of the Atlas tires sold through Standard Oil stations. United States Rubber Co., of Detroit, which has made the other half of Atlas tires, now has taken the full business, and it is reported that this duPont-controlled company will challenge the constitutionality of the Robinson-Patman Act.

Representative Wright Patman has a new measure up his sleeve to present at the forthcoming session of Congress. It would bar manufacturers from the retail business and give them three years to get out of it. This bill, if enacted, will strike a heavy blow at major tire manufacturers who within recent years have established their own chains of retail stores and have invested upwards of $150,000,000 in such establishments. Naturally dealers will welcome this measure, as they did the Robinson-Patman Act. They see a new day dawning—a day when the independent shall reestablish himself and be free from cut price chain store and mail-order house competition.

Let's look at the price situation for a moment. Thanks to the manufacture of tires (comparable in quality and value to those made for dealer distribution) by major manufacturers for mass-distributor resale at prices from 32 to 55 per cent less than dealer prices, the retail tire price structure has tumbled progressively for the past 10 years.

In 1914 an average tire and tube cost the motorist $43.60 and he used several tires per year, and his tires gave him only a few thousand miles of uncertain service. Today the motorist pays an average of only around $10 per tire and tube and gets 25,000 miles service. In other words he pays one-fourth as much and gets 10 times the 1914 mileage. Between 1926 and 1933 there were 18 tire price cuts. Since last November first the industry has had its first practical and workable price stabilization program and has enjoyed its first year in two decades, without price cutting. But at that prices are economically too low—or else tires are too good, for despite heavy sales (52,000,000 tires this year) the tire industry wallows in the quagmire of profitless operation. True, some companies have shown better earning capacity, but stockholders have been starving for dividends for several years.

Naturally, though, lower tire costs have contributed materially to lower car costs; lower car costs have increased the buying power of the masses and put the automobile within the reach of millions; increased buying power has produced increasing spending desire which in turn has brought about an elevation in living standards. The net of it is that the tire industry has waved the baton and quickened the tempo of living—all of which has contributed significantly to economic recovery during the past two years.

Going back to the manufacturing end of the tire industry—Thomas Carlyle once remarked that excluding the alphabet the greatest inventions were those that bridge space. In this category we can place the automobile. Likewise the developments in the tire industry have followed the same trend. Rubber in service is always subject to one or more of the three types of strains—tensile, compressive and shear strain. In tensile we have the inner tube; in compression the solid tire, and in shear, the vibration damper.

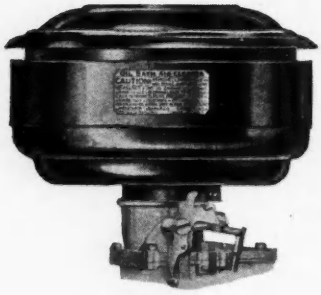
Perfect Timing
by LINK-BELT
A CARE-FREE SMOOTH RUNNING
Engine . . .
● Link-Belt Silverstreak silent timing chains contribute to the pleasure of modern motoring—because "timed by Link-Belt" means timed for maximum, maintained efficiency. And, back of superior design and construction (rotating pin-bushed joint and "no-back-bend" features), stands a great engineering organization never satisfied with present standards of excellence but constantly striving for higher degrees of perfection . . . Each year more cars are standardizing on Link-Belt Silverstreak silent chain drives.
9054-A
LINK-BELT COMPANY
INDIANAPOLIS
DETROIT

The pneumatic tire not only has speeded automotive transportation and made it more comfortable, but it has speeded commercial truck transportation, increasing the mobility and radii of trucks through the use of pneumatic tires instead of solids or cushions.

In the last three years there has been tremendous acceleration to the development of rubber for uses other than tires and tubes, for automobiles. As a matter of fact at the present writing there is more rubber used on engine mountings, in fittings, and in body joints of the average automobile, than in the tires and tubes on which that automobile rides. Sponge rubber upholstering has been developed. It is even used as fillers for inner tubes. It is used for seat cushions and backs, arm rests, straps, etc.

And yet—despite all its progress and all of the fullness of its contribution to civilization, rubber has barely scratched the surface of its potentialities. Tire engineers predict that the day is not far away when automobile engineers can design springless cars, letting rubber do the work now done by steel sheafs. And what about rubber pavements?—not a dream but an actuality. Many communities have rubber pavements. Thousands of miles of new pavement have special rubber expansion joints. Rubber paving blocks are coming into increased use. Our fast transcontinental bus lines maintain speeds of 60 m.p.h., traveling on tires and tubes specially designed to resist and dissipate heat. Water boils at 212 deg. F. Tires on buses and on many passenger cars must perform continually at temperatures as high as 225 deg. F.

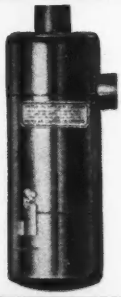
As to personalities in the tire industry—there are many of unusual interest with two outstanding. The dean of the tire industry naturally is that lion hearted and beloved pioneer Frank A. Seiberling, founder of Goodyear, now president of the Seiberling Rubber Company, inventor of the first tire building machinery and still keen, alert and active at the age of 77. Next is Harvey S. Firestone, founder and chairman of the Firestone Tire & Rubber Co. and one of the industry's colorful and dynamic figures. Goodyear's president—Paul Litchfield—who started to work for Frank Seiberling at Goodyear 35 years ago as a graduate of M.I.T., has been the storm center largely because of the Goodyear-Sears Roebuck contract and the Federal Trade Commission's prosecution thereof. The commission on last spring declared this contract violated the Clayton Act. Goodyear appealed the commission's ruling, but terminated the contract, claiming, however, that the cancellation was not in compliance with the commission's "cease and desist" order but because of the provisions of the Robinson-Patman Act. Heading Goodrich is the suave James D. Tew, son of one of the early associates of Dr. Benjamin Franklin Goodrich who founded the Goodrich Co., in Akron in 1870 as the first rubber plant west of the Alleghenies. General Tire & Rubber Co. has its jovial Bill O'Neil. United States Rubber at Detroit has its adroit Francis Breese Davis, Jr., a duPont protege. Down the line we find Col. Charles Speaks, formerly Firestone right-hand man, just getting acclimated in the presidential saddle of Fiske; J. J. Watson heading Lee but most of the executive work shouldered by a son-in-law, A. A. Garthwaite; youthful Ray Bloch as president of Mohawk with veteran Samuel S. Miller, its founder, as chairman; John W. Thomas, Firestone protege, as president of that company under H. F.'s chairmanship; A. C. Bowers directing the destinies (without presidential title) of Pennsylvania; W. C. Stevens, as always, directing the destinies of Mansfield; Carl Pharis as general manager of Pharis; C. C. Gates still heading Gates at Denver; John A. McMillan,



"HAT" TYPE

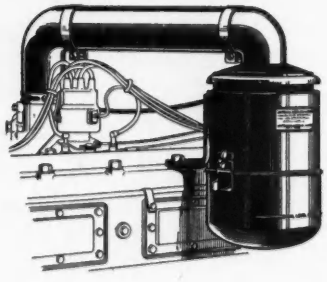
UNITED
Oil Bath Air
Cleaners

AGRICULTURAL TYPE
Air Stream Completely Sealed Off With Oil
HIGHEST CLEANING EFFICIENCY

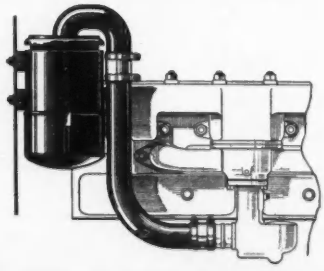


This type of Oil Bath air cleaner designed for use on passenger and light commercial trucks equipped with Downdraft carburetors and which operate over highways and streets where dust conditions are too severe for an ordinary screen.
Heavy gauge steel construction throughout —**no solder**—has removable filter element. Electric welded fabrication Gasoline mileage unaffected by even a pound of trapped dirt in oil reservoir Quickly and easily installed with a common screw driver.

HEAVY-DUTY, TRUCK, AUTOMOTIVE AND INDUSTRIAL TYPES OIL BATH AIR CLEANERS
With Big Dirt Trapping Capacity



Dash or cowl mounted type is very popular for making installation in the field. If bent pipe is not available, flexible tubing, taped and shellacked and with radiator hose fittings make an excellent clean air line between cleaner and carburetor air horn.



Motor mounted type can be furnished for several makes of trucks equipped with either up or Downdraft carburetor.

UNITED AIR CLEANER CO.
9705 Cottage Grove Ave. Chicago, Illinois

now chairman, relinquishing the presidential duties of Dayton to A. L. Freedlander and sojourning in Europe; E. B. Germain heading Dunlop; E. S. Burke managing Kelly-Springfield (under Goodyear subsidy); and John Whitehead heading Norwalk.

This year marks the eighth successive year in which replacement tire sales, in units, have declined from the peak of 49,500,000 in 1928. But 1937 will mark the turning point the industry is confident. It sees 29,500,000 replacement sales in 1937 against 28,500,000 in 1936 and it sees an original equipment demand for 22,500,000 tires—largest on record. It sees the new trailer industry meaning a heavy tire demand, with each trailer on the road requiring at least one new replacement tire per year. It sees stabilized prices, steady raw material costs, and better harmony.

In 1937 the American rubber and tire industry will use enough rubber to make a solid column as high and wide and deep as the Empire State Building. In Akron alone, for every second ticked off on the watch, a pneumatic tire will be made. Come what may — economic depressions — labor strife—or what not—the rubber and tire industry will go on.

Millions for Better Cars and Working Conditions

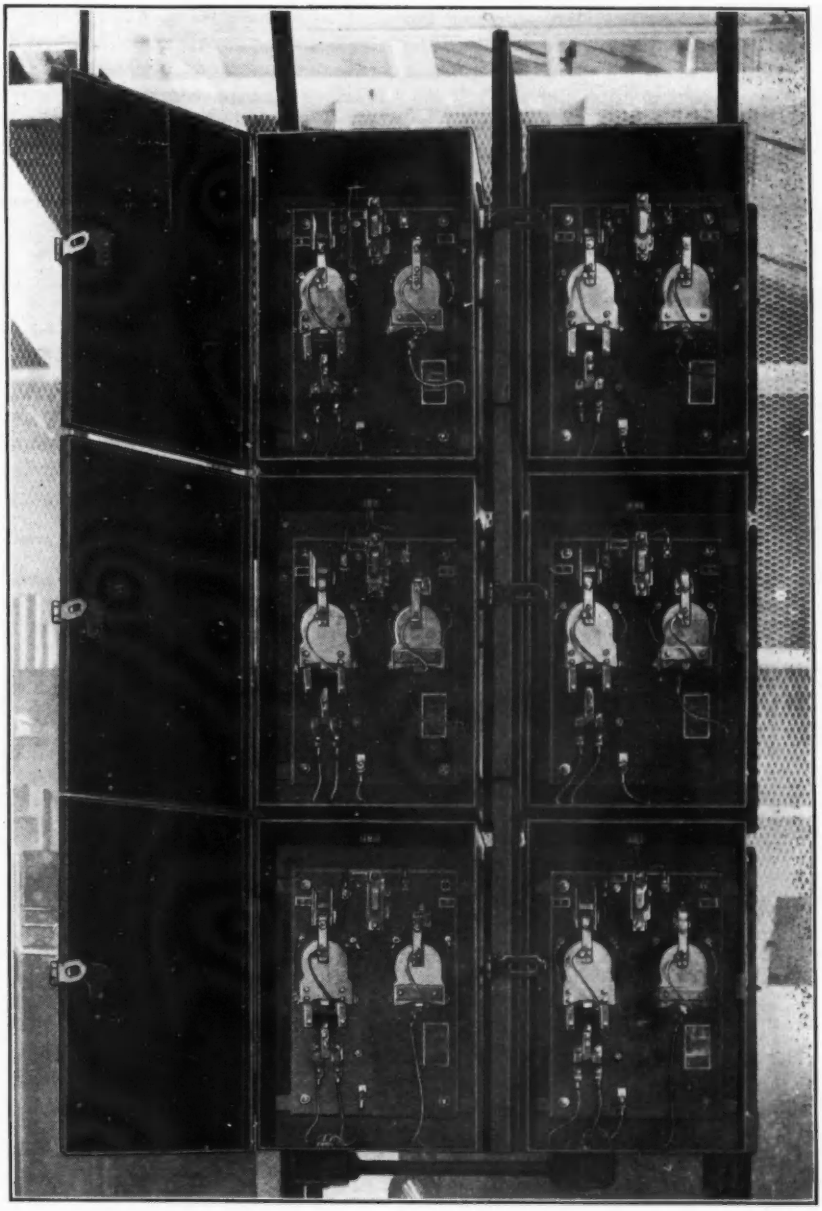
(Continued from page 601)

the general run of production the industry has utilized every welding technique that offers the solution for an individual problem. Thus we find in regular use—resistance welding in many forms, oxy-acetylene torch welding and arc-welding as developed by General Electric, Lincoln Welder, and others.

Perhaps the biggest field opened to resistance welding recently, is in the seam-welding of gas tanks and some really interesting equipment for this purpose has been installed at Pontiac and Nash this season. These two installations were made by National Welding Machines Co. Taylor-Winfield has just installed a battery of special flash welders at Pontiac for welding a corner on the front fender.

Some of the recent progress in resistance welding of many varieties has been achieved by the development of new welding electrode alloys, particularly by P. R. Mallory, in combination with water-cooling of electrodes to increase tool life and produce better weld quality. Another forward step has been the recent development of automatic timing controls which give an accurate control of welding time and

CLARK-SUNDH Heavy Duty Industrial Control



A convenient grouping of Clark Automatic D.C. Starters for the control of a six spindle deep hole Drilling Machine

Write for Bulletins 5360 and 5370

THE CLARK CONTROLLER CO.
1146 E. 152ND ST.
CLEVELAND, OHIO

temperature. Without such controls the welding of stainless steels would be almost impossible as a commercial process.

Foundry practice has been revolutionized in recent years by the introduction of automatic and semi-automatic molding machines, core blowers, and sand-slingers for large cores. These not only increase productivity and improve quality, but also are the greatest instruments for improving working conditions and eliminating back-breaking manual labor.

Materials handling offers fresh surprises in the many novel applications that are found at every turn. Pouring conveyors in the foundry have placed the job on a real production basis. Conveyors of every type are no novelty in the automobile plant, but they are being extended to every corner and have been adopted by many parts makers even where the volume of production is not so large.

Many interesting developments will be found in small tools for metal cutting. Cemented carbides of every variety are in common use wherever justified and in recent years have largely replaced the diamond for single-point boring of cylinders and even smaller bores. Other tool materials such as J-Metal, for example, are finding wide application. One of the novelties brought out this season is the new reamer design developed by Packard. This was described in AUTOMOTIVE INDUSTRIES recently.

Metal stretching has become a widely recognized art. One of the best examples may be found at Buick where the handsome front fender is produced in one piece. This is a classic job. It stretched the imagination and patience, as well, but Buick is satisfied that the method now in use does a remarkable job at the lowest possible cost. Pontiac, too, makes a one-piece fender, but by close harmony between engineering and the press shop experts, they have developed a design that can be drawn in just on operation. To accomplish this, it was necessary to leave off one corner and then weld it on by means of the new Taylor-Winfield flash welding machine.

During the past two years great strides have been made in sheet metal cleaning and the preparation of large sheet metal surfaces for painting. Whereas heretofore it was necessary to dip fenders and other parts in tanks containing corrosion-resisting solutions, many plants have installed the now familiar Spra-Bonerite equipment which handles the sheet metal while it moves on the conveyor and applies the chemical coating by means of spraying nozzles. A. C. P. "Cromodine" is applied in similar fashion. Both processes have cut the time required to but a fraction of previous experience.

For metal cleaning of large parts such as fenders, the industry has available washing machines of enormous size, larger than anything considered practicable in the past. One example of this is the huge Rex degreaser which was described some short time ago; another, is the Blakeslee fender washer just installed at Pontiac. The latter is built in three sections, the unit extending some 160 ft. in length.

Peugeot Not Rear-Engined

We learn that the photograph used to illustrate our report of the Paris automobile show and captioned "Peugoet rear-engined car" is in a reality of a car composed of a Peugeot standard Model 402 chassis with front-mounted engine, and a highly streamlined body designed by the French aerodynamic expert Andreau. It was characterized as "the car of 1940."

The Western Felt Works, Chicago, Ill., has assigned to its Detroit office William C. Enright, who has been closely engaged in the automotive industry for a number of years as technician to cooperate with the engineering and purchasing staffs of its customers.

HIGH GRADE - - LATE TYPE

USED

PRODUCTION EQUIPMENT

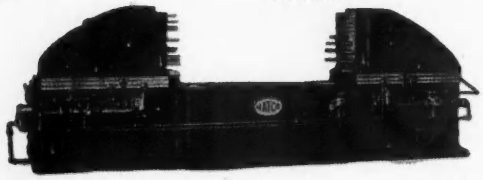
for immediate delivery

LATHES

14"x19" Fay Automatic
14"x33" Fay Automatic
6¼"x15" Model R LoSwing
4"x15" LoSwing, hardened ways
4"x36" LoSwing, hardened ways
8" Sundstrand Stub
12" Sundstrand Stub
No. 1-A Warner & Swasey
No. 1-F Foster Fastermatic
No. 4-D Potter & Johnston
Gisholt Simplimatics

MILLING MACHINES

No. 3 Sundstrand Rigidmills
No. 40 Sundstrand Duplex Hydraulic
No. 45-48" Cincinnati Hydromatic Openside
No. 4-48" Cincinnati Hydromatic with vertical head
No. 4-36" Cincinnati Duplex Hydromatic
Cincinnati Automatic Duplex—all sizes
Cincinnati Single Head Automatics—all sizes
No. 2 Kent Owens Hand Mills
Also full range of sizes in plain, universal and vertical.



DRILLS

Natco Horizontal Hydraulic Duplex
Fox 3-Way Horizontal Hydraulic
No. 450 W. F. & J. Barnes Horizontal Drilling and Tapping
No. 920 Barnes Vertical Hydraulic
No. 50-H Baker Vertical Hydraulic
No. 25-H Baker Vertical Hydraulic
No. 624 Baker 6-Spindle Vertical
Natco Multiple Drills—all sizes
Baush Multiple Drills—all sizes
Fox Multiple Drills

DRILLS

21" and 24" Cincinnati Upright with tapping
No. 217, 310, 314, 315, 321, 422, and 513 Baker Heavy Duty Drills
Colburn D-2, D-4, D-5, and D-6
Foote-Burt No. 23, 24, and 25 High Duty
No. 10-D Moline Cylinder Borers
No. 214 Barnes 8-spdl. Honer

GRINDERS

No. 12-A Bryant Internal & External
No. 72-A-3 Heald Size-Matic
No. 72-A-3 Heald Gage-Matic
No. 72 Heald Size-Matic
No. 12 Greenfield "Hydroil"
No. 2 Cincinnati Centerless
No. 25-A Heald Surface
14" Model B Pratt & Whitney Surface
No. 16 Blanchard 30" chuck
No. 16-A Blanchard Automatic
Norton, Landis, Cincinnati Plain Cylindrical

BROACHING MACHINES

No. 4 Type XA Oilgear
No. 3 Oilgear
No. XB-10 Oilgear Twin
No. 3-HY American Hydraulic
No. 2-L J. N. LaPointe Hydraulic
V-50 American Vertical
No. 1 Foote-Burt Hydraulic Surface Broach

BULLARD PRODUCTION MACHINES

14" Bullard Mult-Au-Matics
Bullard Contin-U-Matics

GEAR MACHINES

No. 12 Barber Colman, double overarm
16" Cincinnati Gear Hobber
No. 5-A Lees Bradner Generators
No. 5-AC Lees Bradner Generators
No. 2 Lees Bradner Manufacturing Generators
No. 1 Lees Bradner Production Hobber
Gleason Spiral Bevel Gear Roughers
Gleason Spiral Bevel Pinion Roughers
Gleason Testing Machines
No. 75 Fellows Gear Shapers
No. 16-HS Gould & Eberhardt Mfg. Hobbers

FORGING MACHINES

4" Ajax Upsetters, steel bed
3" Ajax Upsetters, steel bed
2" Ajax Upsetters, steel bed
2½" Ajax Heavy Duty Upsetter
1" Ajax Upsetter, steel bed
5" National Heavy Pattern
4" National Heavy Pattern

The foregoing is only a partial listing of our actual stock. Practically all of our machines are either motor driven or arranged for motor drive. When you are in need of equipment, may we suggest that you consider our stock.

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LOUIS E. EMERMAN & COMPANY
1760 ELSTON AVENUE CHICAGO, ILLINOIS

Over Six Million Tons of Steel for 1937 Automobiles

(*Continued from page 607*)

shipping departments of steel mills, testify to the cooperative spirit that animates the relationship between the steel makers and their customers.

With a better understanding of the steel industry's problems, automotive consumers have become more practical in covering their steel requirements. So, for instance, sheets that consume a relatively long time in the finishing process are much more generally ordered a sufficient time ahead to give the mills sufficient time for orderly routing than was formerly the case. Aside from the physical obstacles to the stocking of many descriptions of steel, automobile manufacturers, in the very nature of their own business, cannot indulge in long-term stocking of material, as would a textile mill in provisioning itself with cotton. A mutually satisfactory method of buying and specifying has apparently been developed, eliminating stocking by automobile manufacturers on the one hand and an avalanche of rush shipment business that would inundate the steel mills on the other.

An outstanding development in the steel market in recent months has been a tendency on the part of the mills to set up quantity differentials in favor of the large buyers. In adopting this course they have merely heeded the criticism of representative automotive consumers that former price structures failed to afford to large buyers the advantage to which they considered themselves justly entitled.

In the present stage of knowledge regarding the provisions of the Robinson-Patman Act, awaiting as they do for the most part administrative, to say nothing of judicial interpretation, opinion as to whether and to what extent the price set-up in the steel industry may have to be modified has not yet taken definite shape. Certain it is that the law does sanction quantity differentials, so long as no buyer within a class is discriminated against.

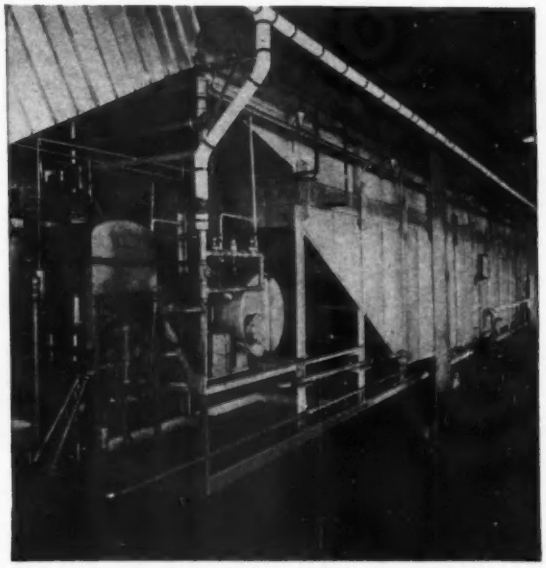
What causes steel producers more uneasiness is that some would-be statesman at the next session of Congress might seek fame by reviving the basing point issue, ready at hand as it always is, as a means of letting the folks back home know that their representative is after the scalp of big business. In this, too, automobile manufacturers whose price structure rests on one basing point, sympathize with the viewpoint of the steel industry. Theorists' opinions notwithstanding, the present basing point system of the steel industry works and is giving no cause for complaint to consumers.

During the recent bulge in steel demand, one heard much that improvements and expansion in furnace and primary steel making capacity had lagged behind the spectacular expansion of and progress in rolling mill equipment. Several producers have contributed toward a correction of this condition by enlarging their furnace capacity. Further progress in this direction is certain to result from the plans of others for 1937.

Nor has the rolling mill industry quite completed its transition from old-time methods to those made possible by modern, continuous mills with the most efficient equipment for heat-treating. By the side of these automatic

SCIENTIFIC METAL CLEANING
for the Automotive Industries

Economy, speed, and efficiency in all industrial cleaning operations are assured by Detroit-Rex complete metal cleaning service.



High productions of fenders and other automobile parts are thoroughly cleaned in this mammoth, conveyorized Detrex Degreaser.

Degreasers

Detrex Degreasing . . . the simplest and most rapid method of removing oil and grease from all kinds of metal products prior to rust-proofing, finishing, inspection, or heat treating. . . . Found indispensable by manufacturers of automobile bodies, motors, accessories, stampings, die castings, screw machine products, etc.

Complete line of standard and special models ranges from small, hand-operated units, to large completely automatic, conveyorized machines. Available in any combination of vapor, liquid immersion, and hot solvent spray.

Safety Solvents

Perm-A-Clor or Triad—the non-inflammable and non-explosive safety solvents—are used in Detrex Degreasers. Both of these solvents have the same cleaning properties, but Perm-A-Clor is the most highly stabilized solvent on the market.

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Triad Alkali Cleaning and Stripping Compounds are scientifically prepared for specific applications. They have the penetration, wetting action, emulsifying power, and free rinsing qualities so essential to efficiency.

Their effective cleaning at low alkalinity makes for safety . . . the dangers of caustic burns and excessive foaming being eliminated. They are guaranteed to reduce costs or produce better results to your own satisfaction.

Write for new booklet entitled "Scientific Metal Cleaning."

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plants there are still operating some of the old type mills, and only within the last few months some of these came in for considerable business, made up of individual orders in which the tonnage involved in each was unattractive, if not entirely unsuitable for profitable continuous mill production.

To what extent the demand for lighter-gage sheets in all-steel construction of 1937 models will affect the picture of the rolling mill industry remains to be seen. The general impression in the steel market is that the tonnage demand of automobile manufacturers in the next few years will more than justify the huge investments in rolling and finishing equipment. Capacity of these recent additions to the country's steel-making equipment is making itself more and more felt and their potential output is such that, in so far as rolling and finishing are concerned, the lately much heard talk of a steel famine is a case of unjustifiable exaggeration.

For the first time in years, scarcity of scrap iron was pointed to a few months ago as a possible element in forcing finished steel prices higher. Inasmuch as the automotive industries furnish considerable of the country's scrap, paucity of scrap affects them both in the capacity of finished steel consumers as well as marketers of much of the scrap that enters into the making of steel. Before automobile manufacturers got their recovery program under way, huge piles of scrap had accumulated in dealers' yards. The steel mills were out of the scrap market, not having very much in the way of orders on their books. So the scrap dealers, unable to find a market for their accumulations at home, turned for relief abroad and shipped thousands of tons to iron-poor countries, such as Japan and Italy. This made a big hole in the home supply, and when the steel mills began to need replenishments, they found themselves up against stiff price demands. The scrap iron market has always been a highly speculative institution and quite possibly dealers and so-called brokers, who in fact are large dealers, overestimated the gap between demand and supply. The situation is gradually getting back to normal. For a time there was much talk of steel makers having had to increase the amount of virgin pig iron in their melts, but conditions are now on the mend.

Pig Iron Up $1 in 1936

There has been a $1 per ton increase in the price that automotive foundries have had to pay for their pig iron this year, compared with that in vogue during the greater part of 1935. Some of the pig iron producers are withdrawing from the market at this time, this being part of the stage-setting for another $1 advance to apply to 1937 initial business. Again it must be pointed out that, in the light of the market's record over a period of years, pig iron prices have moved on a normal readjustment basis and buyers have little to complain of.

An advance in the price of copper to 10 cents on Oct. 26 denotes a recovery from 7⅞ cents, the low for the 1935-36 period. More than 200,000,000 lb. of copper, it is estimated, went into the making of automobiles and motor trucks this year, the automobile industry's purchases being exceeded only by those of the electrical manufacturers. With the building industry, in normal times a large consumer of copper, not yet out of the woods, it is certain that automotive consumption gave a much needed fillip to the copper market.

In spite of the dip in sterling exchange as the result of the monetary pact with Great Britain and France, tin is selling today at a considerably higher price than last summer and quite possibly this improvement was in no small measure due to the recovery in automotive takings, which are

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This special lapping practice is exclusive with Strom.

Physical soundness — correct hardness — size accuracy and sphericity are guaranteed in all Strom Balls.

Other types of balls — STAINLESS STEEL — MONEL — BRASS & BRONZE — are also available in all standard sizes. Write for full details.

Strom STEEL BALL CO.
1850 So. 54th Avenue, Cicero, Ill.
The largest independent and exclusive Metal Ball Manufacturer

now running at considerably above the 9000-gross ton consumption of last year.

The energy displayed in the marketing of certain new types of aluminum alloy pistons indicates that the aluminum industry is determined to share to the fullest extent possible in the recovery that has been achieved through the initiative of the automobile manufacturing industry. Lead producers and marketers, too, have benefited from the recovery program, prices recently having been marked up, following a long period of stagnant markets. Sales of cadmium, which is still more or less in the introductory stage in the automotive field, are showing steady expansion.

Mines and mills reverberate with activity today, where before the automobile manufacturing industry set the pace toward the now attained goal of recovery, there was nothing but portentous silence.

Surface Hardening Ohio Crankshafts

REFERENCES have been made in these columns a number of times to a surface-hardening process introduced by the Ohio Crankshaft Company of Cleveland. It is known as the Tocco process and is based on induction heating. In automotive production it is applicable particularly to the bearing surfaces of crankshafts, which it is desirable to harden whenever some of the new hard bearing alloys are used.

A high-frequency current is first transformed from high to low voltage, and the heavy low-voltage current is passed through inductor blocks which surround the bearing journal without actually touching it. The inductor-block current induces current in the surface of the metal which the block surrounds, and it is this induced current which heats the surface to be hardened. When the area to be hardened has been thus subjected to an accurately controlled high-frequency current for the proper length of time, the electrical circuit is opened and simultaneously the heated surface is quenched by a spray from a water jacket built into the inductor block. When all of the main and crankpin bearings are hardened, the entire shaft is drawn at a low temperature to remove strains. A final grinding operation then completes the shaft.

It is claimed that the combination of instantaneous pressure quenching with an accurately controlled heating cycle produces a surface-hardened zone blending gradually into the core, with no sharp line of demarcation and consequently no opportunity for spalling.

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PRECISION BORING MACHINES
Bring NEW ACCURACY and ECONOMY
to Boring, Turning, and
Facing Operations

Made in 5 sizes to meet every production requirement. "Junior" series is illustrated. Send for complete information.

EX-CELL-O
AIRCRAFT & TOOL CORPORATION
DETROIT, MICHIGAN

New Developments

(Continued from page 621)

Compressors

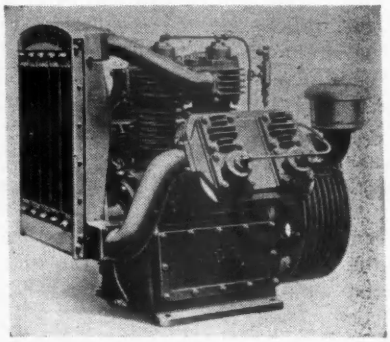
Three and Six Cylinder Units Developed by Worthington

A line of compact, self-contained, three- and six-cylinder, vertical angle, two-stage compressors with capacities ranging from 142 to 445 cu. ft. per min., has been developed by the Worthington Pump and Machinery Corp., Harrison, N. J.

The three-cylinder unit has two low-pressure cylinders set opposite each other at an angle, with a high-pressure cylinder set vertically between them. The six-cylinder unit is set up in the same manner, with two cylinders side by side in each position. These units may be had with Multi-V-Drive, direct-connected to the engine through a flexible coupling, or with the engine mounted directly on the end of the crankshaft.

Automotive type pistons with two compression rings, two oil rings and full-floating wrist pins are used on all models. Articulated connecting rods permit the use of a large crank pin bearing and the same center line for all cylinders.

A finned, radiator type intercooler, with a fan which draws air through the cooler and over the cylinder head,



Worthington compressor

quickly removes the heat of compression. A large oil reservoir in the crankcase, force-feed lubrication, an air cooler and an oil filter provide for lubrication of all moving parts.

3000°
OF SEARING, BURNING, WEAR-PRODUCING HEAT
Heat, caused by the raging inferno of ignited gasses under the high temperatures and pressures existing in the combustion zone, takes a terrific toll of oil and metal.
Graphite, a solid lubricant, created in the electric furnace at a temperature of 5000° F. withstands high temperatures without difficulty.
Thus, in the 1000° F. temperature existing on the upper cylinder walls and pistons, oil, making a valiant effort to surmount this holocaust of fire, can be materially aided by "dag" colloidal graphite.
This material serves, through the medium of the graphoid surface, as a perfect background for oil. It easily withstands the temperatures around the friction parts. This microscopically thin surface of graphite is there during the momentary breaks in the oil film, co-operating in the battle against wear. And due to its great attraction for oil, hastens quick return to full film lubrication.
The value of the graphoid surface is forcefully demonstrated when starting engines from cold--also, a period when, automotive authorities state, substantial wear occurs. The protective graphite film cuts this to a minimum and safeguards the parts until the oil is circulating freely. Send for booklet discussing the use of "dag" colloidal graphite in this application and also crankcase and spring lubrication.
Ask your oil supplier about his colloidal-graphited brands today
ACHESON COLLOIDS CORPORATION ◆ ◆ PORT HURON, MICHIGAN
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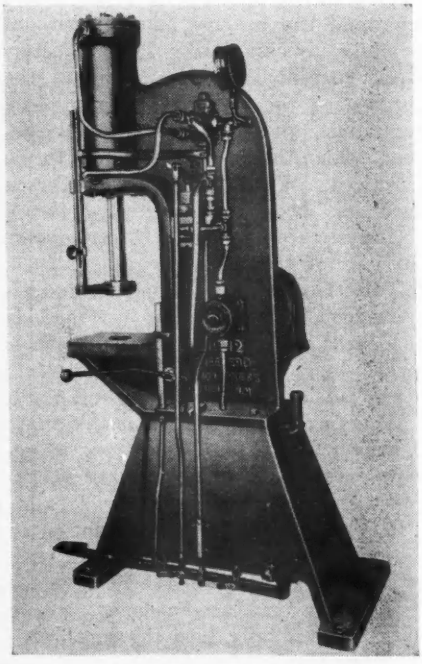
COLLOIDAL GRAPHITE
"DAG" COLLOIDAL GRAPHITE IS A 100% AMERICAN MADE MATERIAL

Ball Bearing Assembly

Edwin E. Bartlett Co. Develops 15-Ton Hydraulic Press

A 15-ton Greenerd hydraulic press, specially designed for assembling ball bearings when used in conjunction with necessary fixtures, and also adaptable for straightening work when equipped with a special straightening table, has been developed by the Edwin E. Bartlett Co., Nashua, N. H.

The No. 60 BB machine is operated by a foot treadle and the amount of



Bartlett 15-ton hydraulic press

pressure exerted by the ram is controlled by the amount of pressure applied to this handle. Pressure may be held evenly by foot treadle or locked by hand lever.

When the pressure is locked it will remain indefinitely and evenly until the hand lever is tripped which will automatically return the ram to power stop which may be set at any predetermined point. The pressure also may be held evenly by foot treadle which, when released, will return the ram automatically to the power stop. When the ram is at the top position the pump bypasses, relieving all pressure.

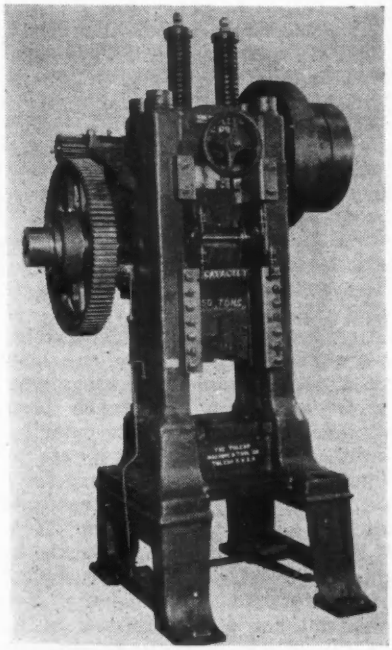
Essential dimensions of the machine include: ram diameter, 2 7/16 in.; speed of ram on down stroke, 36 in. per min.; stroke adjustment, 0 to 16 in. on up stroke; pressure on down stroke, ½ to 15 tons; height over table with ram up, 16 in.; working table, 12 in. by 12 in. with a 3½-in. cored hole in center; capacity to receive work up to 18 in. in diameter.

Coining

150-Ton Tie-Rod Frame Press Developed by Toledo

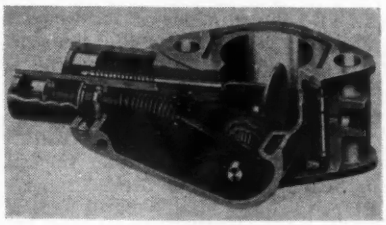
The Toledo Machine & Tool Co., division of E. W. Bliss Co., Toledo, Ohio, has announced the development of a 150-ton tie-rod frame press for the sizing or cold finishing of forgings and other coining, extruding, swaging and cold squeezing operations.

Features of this equipment include the rolling key clutch and the tie-rod frame construction. The uprights, crown and bed are made of pearlitic alloy castings and are held together by steel "shrunk-in" tie rods.



Toledo 150-ton tie-rod frame press

These machines are available with capacities ranging from 25 tons to 2500 tons. The operating speed of the geared press illustrated is 43 strokes per min.



Handy Vari-speed governor

Stop Light Switch

Douglas Develops Mechanism To Give Pre-Warning

The H. A. Douglas Co., Bronson, Mich., has developed a switch that flashes the caution light *before* any actual braking effort is applied.

Mechanical operation of the device is such as to provide pre-warning. The stop-light switch closes whenever a slight pressure is applied to the brake pedal so that the caution light flashes on well before the pedal has been depressed sufficiently to slow down.

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Good Steel
Quickly
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STEEL-SERVICE
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Order Bank Mounts

(Continued from page 637)

December will have to skirt the half-million mark for the final quarter to beat the corresponding period of last year when 1,107,183 cars and trucks were turned out.

October production did not quite come up to earlier expectations, due to the late start on new models by Ford and Oldsmobile. Official figures have not been released but a close check indicates that approximately 230,000 units were built last month. This compares with 280,316 in October, 1935, and represents a decline of 50,000 units, or 18 per cent. With the increased capacities of plants this year and the ready market that exists for the new models, this drop in output during the first month of the current quarter easily can be made up in the last two months.

It is not likely that the entire industry will hit its maximum stride, which is considerably above 500,000 units monthly, before the end of the year but the production curve should continue on the upgrade throughout the final quarter. Some plants already are operating up to the hilt. Several have had to revise upward their original schedules for November to meet the unexpectedly heavy demand that developed for the 1937 cars. Dealers of companies late in announcing have been booking orders in large volume without having cars to show. Chevrolet is understood to have over 100,000 unfilled retail orders and the new line did not go on display until this week-end.

October shipments of Graham cars were the best for any October since 1929 with November schedules calling for shipment exceeding even the 1929 total for that month. Production has been stepped up as rapidly as possible to meet a growing bank of dealer orders which at the present time already exceed orders for the entire last quarter of 1935. Similarly, shipments by Nov. 15 will have exceeded shipments for the entire final quarter of last year, with every indication that the last quarter of this year may set a new high, exceeding the previous fourth quarter peak of 7900 in 1928 and bettering the like period of 1929 by some 30 per cent.

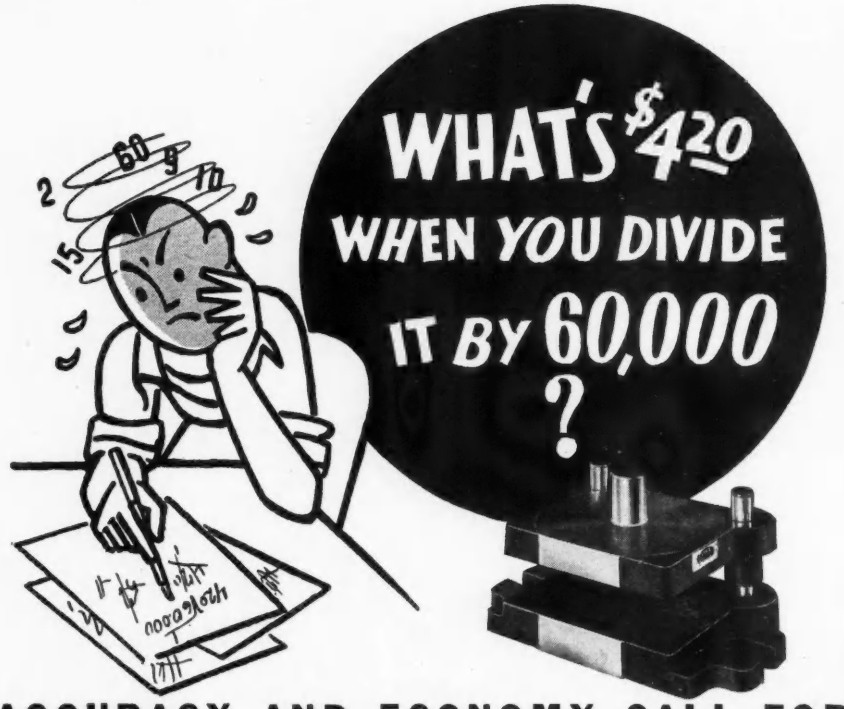
Production by the Buick Motor Co., since the introduction of its 1937 models, this week reached a total of 23,912 units, according to Harlow H. Curtice, president, who disclosed that a sharp upward revision is being made in the schedules for November and December as a result of the unprecedented acceptance of the new cars. The new schedules call for the production of 25,434 cars during November and 27,326 in December despite the holidays that fall in each month.

Tire Plans Advance

(Continued from page 637)

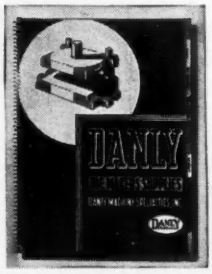
tive circles the belief is growing that the Ford tire building venture will be a cooperative Ford-Firestone program, for in view of their long and close business affiliation and the fact that the Ford Company has always purchased the bulk of its original equipment tires from Firestone, it is inconceivable that the two will be divorced from each other in the matter of tire supplies. Furthermore, the reports of Firestone's collaboration in the Ford program are heightened by the fact that Firestone has made no decentralization moves nor announced any new plants, despite the fact that the Firestone Akron factories have had their share of trouble with labor within the past few weeks.

Already under a veritable avalanche of equipment orders from the major Akron tire companies which are transferring equipment to branch plants and setting up new plants outside of Akron, equipment plants, it is reported, cannot guarantee Ford delivery for at least a year, while some have said a year and a half to two years. Hence the Ford tire building threat to the tire industry in Akron can scarcely materialize fully for many months. Ford plans call for the most modern tire plant in America with 24,000 daily capacity.



ACCURACY AND ECONOMY CALL FOR

DANLY PRECISION DIE SETS



The Danly Catalog gives you the most complete listing on the market—makes it easier to select the proper set to fit the job. Send for your copy.

● 7/1000 of 1¢ per piece is a mighty small cost for the extra advantages a Danly Precision Die Set gives you on a run of 60,000 stampings. More accurate die cut parts throughout the run without "burrs" may spare you the entire expense of finishing. Perfectly aligned die movement is assured because hardened pins and bushings are lapped to within ±1/10,000", eliminating side play, irregular wear and delivering more accurate parts from the first to the sixty-thousandth. Before buying your next die set, get information on Danly Precision sets, of which many are still in service after hundreds of thousands of pieces.

DANLY MACHINE SPECIALTIES, Inc., 2118 S. 52nd Ave., Chicago, Ill.

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DANLY DIE MAKERS' SUPPLIES

Electro-Motive Corp. Adds to Plant Space

Work on a $750,000 addition to the plant of the Electro-Motive Corp. at McCook, Ill., will be started at once, H. L. Hamilton, president, announced Nov. 3. This General Motors subsidiary, constructed less than a year ago, has already outgrown its initial capacity and is making railroad history in its production of Diesel-electric engines for use in streamlined speed trains. Ultimately the project will represent a plant investment of approximately $10,000,000, according to Mr. Hamilton.

The added space, involving 84,000 sq. ft. of floor space, completes the original plans for this part of the plant, and will be ready for occupancy early in 1937. Among the Diesel-electric locomotives built in the plant was the 3000 hp. unit that recently established a new world's record for long distance passenger train haul when it took the Burlington Railroad's Denver Zephyr from Chicago to Denver.

Other notable Diesel-electrics under construction at the plant are those which will haul the City of Los Angeles and the City of San Francisco for the Union Pacific-Northwestern, and the Green Diamond of the Illinois Central, in addition to several huge locomotives for freight service. In the future most of the framework construction formerly done at the Chicago works of Pullman-Standard Car Manufacturing Co., will be built at the McCook plant following completion of the new addition.

Detroit Harvester Purchases Dura, Automotive Parts Maker

Purchase of the Dura Co., makers of automotive hardware and parts, by the Detroit Harvester Co., with a view to merger into a new Detroit-Dura Co. with combined capital of $1,500,000 was announced in Toledo.

The purchase was effected when the Detroit Harvester Co. agreed to buy all the Class A and 60 per cent of the Class B stock, and to guarantee an issue of $500,000 of first mortgage bonds of the Dura Co. The stock acquired by the Detroit Harvester Co., were owned by the Richardson Co., Toledo, and President Folsom. Harry L. Pierson is president and treasurer of the purchasing company and will head the new merger. The Detroit company makes auto parts, motor scythes, power take-offs, street sweepers and other equipment of that type.

Roos Rejoins Studebaker

Paul G. Hoffman, president of the Studebaker Corp., announces that D. G. Roos has been appointed technical advisor of the corporation. Mr. Roos because of ill health resigned several months ago as vice-president in charge of engineering and has been recuperating in the Far West. He will make his headquarters in South Bend but will spend much time in European and in American automotive centers keeping Studebaker abreast of all technical developments in the industry.

Younger to Speak in Detroit

John Younger, head of the department of industrial engineering, Ohio State University, will address the American Society of Tool Engineers in Detroit on Nov. 12. His topic is to be "Rambling Talks on Jig and Fixture Design." Professor Younger is well known in automotive circles and is a former vice-president of the S.A.E. in charge of the Production Activity.

Special SAE Coast Meeting

A Pacific Coast regional Transportation and Maintenance Meeting will be held in Los Angeles Nov. 20-21 by the Southern California Section of the S.A.E. Subjects of the sessions are: Passenger transport, freight transport, regulation, and city delivery. A number of inspection tours have been arranged.

Pierce-Arrow Prices

The Pierce-Arrow Motor Corp., Buffalo, N. Y., announces that the prices of its cars for 1937 are the same as last year.

TOO HEAVY?

DUREZ is 6 times lighter than steel!

You've probably heard about the store scale that had its weight cut from 150 lbs. to 65 lbs. largely through the use of a re-designed plastic case instead of a metal one.

While it's not an automotive application, it shows how Durez can help reduce the weight of all kinds of products — whether they're scales or automotive accessories, or one of the many mechanical or decorative parts on cars, trucks, busses.

Durez has a surprisingly high weight-strength ratio and actually weighs but one-sixth as much as steel. Proper design and proper choice of the many grades of Durez will give you moldings of great strength, lustre and lightness — which are resistant to moisture, wear, heat and electrical losses.

Look your product over carefully to see if there aren't places where the extreme light weight of Durez would be valuable. We'll be glad to work with you in developing new applications. General Plastics, Inc., 211 Walck Road, North Tonawanda, N. Y.

Choice of the Motor Industry **DUREZ** • *Plastic Materials*

Automotive Metal Markets

Quantity Discounts on Sheet Steel Extended; Capacities of Many Mills Believed Underestimated

By William Crawford Hirsch

Finishing mills are now operating on a basis that permits orderly shipment of steel to automotive consumers in conformity with their instructions. There have been further additions to automobile sheet backlogs, but this indicates rather continued ordering of sheets well in advance than new pressure on mills. Parts makers have also added in the last few days to their strip steel commitments.

According to newspaper reports, one of the large Mahoning valley "strip" mills broke all records in October with an output of 73,000 net tons. This pertains to a continuous mill, capable of rolling material up to 79 in. wide. Material 24 in. and wider has come to be classified as sheet, though it may be the product of a strip mill. When this mill was under construction, its annual capacity was rated at 600,000 gross tons. On the basis of its October performance, its potential yearly output has been greatly underestimated.

Possibly some of the other units that were added to flat rolled steel capacity this year may, in actual operation, be found to have a greater capacity than at first estimated, and thus further ease the strain in times of unusually heavy demand.

Further liberalization of the quantity differential on sheets has been announced by one of the large producers. The $3 per ton on orders of 150 tons will apply when not more than six sizes, each 25 tons or more and all to be shipped within 15 days, are ordered. Heretofore the differential applied only to one size and shape, for shipment at one time. Hot-rolled strip will also come in for this interpretation of the differential. Makers of cold finished steel bars are gradually whittling down their old order backlog. A small amount of bar business, placed before the Oct. 1 advance, remains to be completed.

Pig Iron—Announcement of a $1 per ton advance by a New England producer has further prepared buyers in the Middle West markets for the mark-up that has been spoken of as overhanging the pig iron market for some time.

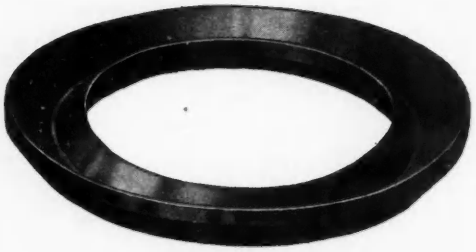
Aluminum—Exports of aluminum from Canada reached a total of 9,370,700 lb. in September, compared with 850,000 lb. in August, but 16,291,300 lb. in July. The market is marking time, quotations for both primary and secondary grades being unchanged.

Copper—Although more than 100,000 tons of copper passed into the hands of fabricators at 9¾ cents following announcement of the advance to 10 cents, the market shows further signs of tightening. There was a report in circulation on Tuesday that 10¼ cents had been paid for one carload. There were other instances that showed reluctance of holders to sell at 10 cents, without wanting to name their asking figure. The export price was up to 10⅝ cents. Rumors are current that speculative interests have accumulated considerable holdings and further advances are freely predicted. Producers' nominal quotation on Monday, however, remained at 10 cents.

Tin—The market opened a shade easier this week, spot Straits being quoted at 45.85 cents, compared with 46 cents at the close of the preceding week.

Lead—Following advances of $4 a ton, the market rules firm and active.

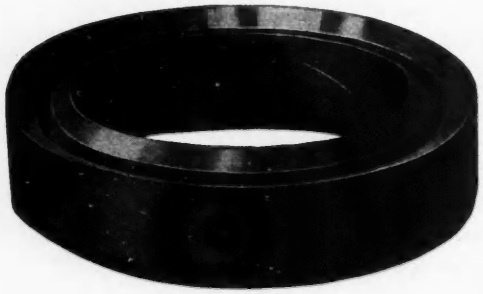
Zinc—Steady and active.



"V" Leather

Cup Leather

Flange Leather



"U" Leather

X-L BRAND LEATHER WASHERS

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X-L MECHANICAL LEATHERS and WASHERS for ALL PURPOSES

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Send Us Specifications or Samples for Prices

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Nothing Takes the Place of Leather

Excelsior Leather Washer Mfg. Co., Inc.

Rockford Illinois

Reo's New Models

(Continued from page 639)

and side skirts conceal the frame. In the cab airplane-type instruments are grouped on the driver's side of the dash, and are matched on the other side by a large package compartment with lock.

The ¾-ton models have full-floating rear axles, heavier springs and larger tires, but otherwise are similar to the ½-ton series. The latter have a semi-floating rear axle, 10-in. clutch, three-speed all-helical transmission, full-pressure lubrication and hydraulic brakes.

The Reo 4-cylinder engine is a new one of L-head design. It has a bore and stroke of 3 3/16 x 4⅝ in., piston displacement of 140 cu. in. and maximum brake horsepower of 45 at 2800

r.p.m. It is a small edition of the service-proved six-cylinder engine with the same bore and stroke.

Other Reo models have been restyled to conform in appearance to the new ½-ton, so that the entire line presents a uniform appearance. Outside of an increase in brake sizes, no fundamental changes have been made in the heavier duty models.

The addition gives Reo a full line. A factory announcement says that other entirely new models will be announced from time to time with the idea of rounding out the line rather than that of replacing current models.

Beauty for Chicago

"Brides of Nations" Show to Brighten Car Displays

Chicago's annual auomobile show will open its doors Saturday morning. Nov. 14, as another galaxy of color and clothes, and indications are that the surprising success which last year's show enjoyed will be surpassed this year. In addition to the automobile exhibits, the National Coach Trailer show is to be held at the same time.

Revealing his plans for the show, Al C. Faeh, manager, said that a fashion show in the nature of "Brides of all Nations" is to be held in conjunction with it. Faeh's recipe for a successful show is described as follows: "Men love women; women love clothes; they both love cars—therefore, give a generous mixture of pretty clothes and pretty cars, with the proper animation, and you have a successful show."

All the exhibitors who were on hand for last year's show will be there again this year. In addition, there will be about 17 manufacturers of coach trailers exhibiting. They will occupy 30,000 sq. ft., taking up the entire north wing of the ground floor.

Of special interest is the convention of the Trailer Coach Manufacturers Association which will meet Nov. 19-20. Speakers at this meeting will include Don Blanchard, editor of *Automobile Trade Journal* who will talk on the need for a dealer organization; Carl R. Olson, vice-president in charge of operations of Keeshin Motor Express, who will discuss legislation; John R. Walker, executive vice-president of the National Association of Sales Finance Companies, who will tell about retail and wholesale financing; Hon. Lew E. Wallace, superintendent of Motor Vehicles for Iowa and president of the American Association of Motor Vehicle Administrators; and Sidney J. Williams, director of the National Safety Council.

Passenger Car Sales 175,000 in October

New passenger car sales for the month of October are estimated at 175,000 by R. L. Polk & Co. This estimate was based on reports of 110 largest cities in the United States for the first 22 days of the month.

French Branch for Brakeblok

Société Anonyme Fadil has been established at Gif, France, by the American Brakeblok Corp. to manufacture American Brakeblok on a royalty basis for distribution in France and the French Colonies. The brake lining is being sold under the name and trademark "Brakeblok." The managing director of the French company is Harry N. Smith, formerly chief engineer of the American Brakeblok Corp. In addition to Mr. Smith, W. A. Blume, vice-president of the American Brakeblok Corp. and R. E. Spokes, chief chemist, also spent several months in France, returning in September. The offices of Société Anonyme Fadil are at 73 Boulevard Haussmann, Paris.

Litle Opens New Laboratories

Thomas J. Litle, Jr., in conjunction with his practice as engineering counsel and patent litigation expert, announces the opening of new devices laboratories, at 733 Seyburn Avenue, Detroit, Mich. Mr. Litle was at one time president of the Society of Automotive Engineers, and has been chief engineer of Lincoln and Marmon Motor Car Companies.

HAVE INGERSOLL ENGINEER YOUR CUTTERS

INGERSOLL Ray BLADE FACE MILLS
AT LAST A UNIVERSAL FACE MILLING CUTTER BLADE
Radially adjusted for Roughing Cutters
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Designed for Medium Duty High Production face milling of Cylinder Blocks, Gear Cases, Motor Frames, etc.
Offers the ultimate in economy in Stellite Face Mills.
Write for circular describing Ingersoll Ray Blade Face Mills.
ROUGHING
100% more Blade wear with Ingersoll Ray Blade Roughing Cutters.
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Uses the universal Ingersoll Ray Blade for greatest efficiency.
THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

HAVE INGERSOLL ENGINEER YOUR CUTTERS

Cadillac-LaSalle for 1937

(*Continued from page 632*)

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Tire sizes remain unchanged. The Series 65 uses the same tires as the Series 70, viz., 7.50-16, four-ply, inflated to 28 lb. Larger outer front wheel bearings are used on 50 and 60.

The common mounting of radiator casing and front-fender supports has been modified. Front fenders and supports are now secured to a cradle in front of the radiator, the cradle being supported at a single point at its center. On Series 50 and 60 the supporting point is at the center of the frame front crossmember, while on larger models the cradle is supported on a bracket in front of the crossmember.

A new instrument board has been designed for Series 50 and 60. Instruments are arranged as at present, except that LaSalle and Cadillac V-8 cars have no choke button. The shape of the projector (horn) has been changed on LaSalle and Cadillac V-8, on which the horn is mounted on the air cleaners.

Two types of "peak load" generators are used in 1937 models. Series 70, 75, 80 and 85 continue with the former generator, the output of which, however, has been increased. A higher setting of the current regulator increases the charging rate through the speed range above 20 miles an hour. A new voltage-regulated generator of high capacity is used on Series 50, 60, and 65. This generator does not have the current regulator, and consequently the charging rate is not constant through the speed range.

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Colonial has pioneered in the development of special grinding machinery giving greater broach accuracy in routine production. Back of every Colonial tooled job is Colonial's experience of 20 years as industry's leading designers and producers of broaches.

There is a Colonial Broach Representative in your Territory.

COLONIAL BROACH COMPANY

147 JOSEPH CAMPAU • DETROIT, MICH.

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Bridgeport, Conn.—A. C. Bisgood
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Rockford, Ill.—E. R. Ekstrom
San Francisco, Calif.—H. E. Stallman
St. Louis, Mo.—R. T. Monahan
St. Paul, Minn.—Robinson, Cary & Sands
Syracuse, N. Y.—Roy W. Glahn
Toledo, Ohio—W. F. Haverstock
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Tulsa, Okla.—Brammer Machine & Tool Service

New Styling Marks the New Chevrolet

(*Continued from page 624*)

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Master and Master DeLuxe models differ with respect to front-end suspension, equipment, and trim. Their steering gear ratios differ, and the use of different rear-axle ratios results in a corresponding difference in performance and economy characteristics between the two series.

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As compared with the Master models, the DeLuxe models have knee-action instead of semi-elliptic front suspension; double-acting shock absorbers front, and single-acting rear, instead of single-acting both front and rear; a worm-and-roller-sector steering gear with 17½-to-1 ratio, instead of a worm-and-straddle-mounted-sector type with 16-to-1 ratio. In the DeLuxe town sedan and coach (two-door models) the front seat has a full-width cushion and divided back, while in the Master model, both the seat cushion and back are divided.

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Features found on the Master DeLuxe only include a water-temperature indicator on the instrument panel, rubber pads on clutch and brake pedals, an instrument-panel ash receiver, a concealed roller curtain at the rear window, a stainless-steel molding on the running boards, bumper guards front and rear, metal covers on the rear springs, and a trumpet-tone horn. The DeLuxe town sedan and coach have additional ash receivers in both back seat arm rests; the sport sedan and sedan have ash receivers in the back of the front seat.

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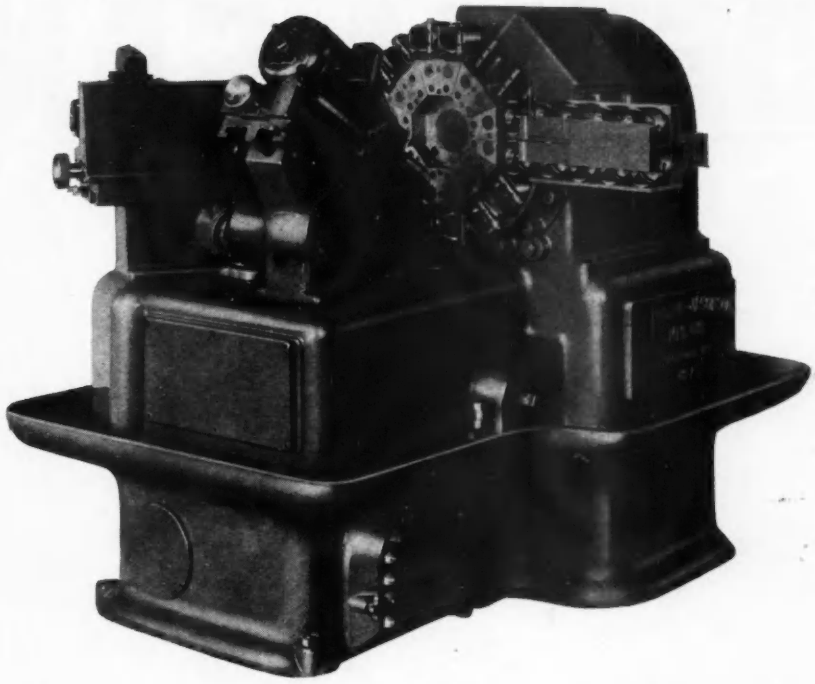

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2135 KISHWAUKEE ST., ROCKFORD, ILL.

Cadillac-LaSalle for 1937

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San Francisco, Calif.—H. E. Stallman
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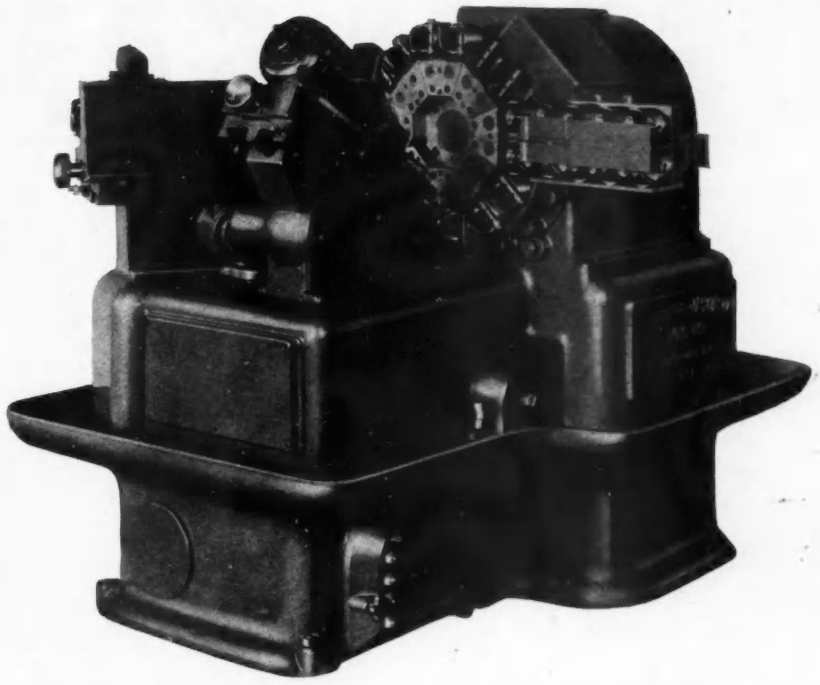

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2135 KISHWAUKEE ST., ROCKFORD, ILL.

Products Described in New Developments Section of AUTOMOTIVE INDUSTRIES

From Jan. 4 to Oct. 24, Inclusive

Automobile Accessories and Equipment

Manufactured by:

AC Spark Plug Co., Flint, Mich. (leakproof spark plugs).

Altherm Products, Inc., Brooklyn, N. Y. (tire inflator).

Edison-Splitdorf Corp., West Orange, N. J. (magneto).

Federal-Mogul Corp., Detroit (bimetallic type cylinder head).

Kathanode Corp., New York (automobile battery).

Leibing Automotive Devices, Inc. (automatic governor).

Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, Ind. (seat cushion).

Monarch Governor Co., Detroit (speed control).

Motor Improvements, Inc., Newark, N. J. (oil filter).

Perfect Circle Co., Hagerstown, Ind. (expander type piston ring).

Pines Winterfront Co., Chicago (metal winterfront).

Synchro-Start Corp., Toledo, Ohio (automatic car starting unit).

Trico Products Corp., Buffalo, N. Y. (vacuum operated fan).

U. S. Rubber Products, Inc., New York (ribbed tread tire).

Vacuum Power Equipment Co., Detroit (power cylinder for brakes).

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OIL DERMATITIS often starts like this . .

FINE metal chips, dropping into cutting lubricant, are often carried by the oil to the worker's skin. Wiping the hands and arms with waste, rubs the chips into the skin, leaves little cuts, through which enter Oil Dermatitis germs. By adding 1 pint of Derma-San to 35 gallons of cutting lubricant you kill pus-forming germs . . . sterilize the oil before it splashes on the skin. Give your men real security against Oil Dermatitis. Order a drum of Derma-San today.

Derma-San is ideal for all general plant sanitation

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Broaching Machines

Manufactured by:

American Broach & Machine Co., Ann Arbor, Mich. (vertical type broaching machine).

Colonial Broach Co., Detroit (15-ton single ram machine).

Oilgear Co., Milwaukee, Wis. (35-ton broaching press).

Drilling Machines

Manufactured by:

Baker Brothers, Inc., Toledo, Ohio (multiple spindle drilling machine).

Foote-Burt Co., Cleveland, Ohio (drilling and tapping machine).

Langelier Mfg. Co., Providence, R. I. (multiple spindle machine).

Rehnberg-Jacobson Mfg. Co., Rockford, Ill. (piston oil hole drilling machine).

Rockford Drilling Machine Co., Rockford, Ill. (horizontal drilling machine).

Grinding Machines

Manufactured by:

Continental Machine Specialties, Inc., Minneapolis, Minn. (continuous grinding and polishing machine).

Ex-Cell-O Aircraft & Tool Corp., Detroit (carbide tool grinder).

Fitchburg Grinding Machine Corp., Fitchburg, Mass. (spline shaft grinder).

Heald Machine Co., Worcester, Mass. (adjustable gap grinder; airplane cylinder grinder).

Hisey-Wolf Machine Co., Cincinnati, Ohio (portable worm thread grinder).

Jones & Lamson Machine Co., Springfield, Vt. (thread grinding machine).

Prosser & Son, Thomas, New York (grinder for cemented carbide tools).

Reed-Prentice Corp., Worcester, Mass. (thread grinder).

Instruments

Manufactured by:

Air Reduction Sales Co., New York (oxygen regulator).

American Meter Co., New York (oxygen metering device).

Bristol Co., Chicago (process cycle controller).

Coats Machine Tool Co., New York (spring testing machine).

Exact Weight Scale Co., Columbus, Ohio (scale for balancing pistons and connecting rods).

Ford Motor Co., Johansson Gage Div., Detroit (new set of gage blocks).

Foxboro Co., Foxboro, Mass. (remote control valve).

General Electric Co., Schenectady, N. Y. (color analyzer; sound level meter).

Illinois Testing Laboratories, Chicago (air velocity meter).

Pyrometer Instrument Co., New York (optical pyrometer).

Sheffield Gage Corp., Dayton, Ohio (adjustable plug gage).

Sight Light Corp., New York (sight light indicator).

Standard Electric Time Co., Springfield, Mass. (chronotachometer for engine testing).

Synthane Corp., Oaks, Pa. (meter for indicating intensity of gear noises).

Taft-Pierce Mfg. Co., Woonsocket, R. I. (grease tester).

Lathes

Manufactured by:

Gisholt Machine Co., Madison, Wis. (high-speed lathes).

Hardinge Brothers, Inc., Elmira, N. J. (bench lathe).

Monarch Machine Tool Co., Sidney, Ohio (semi-automatic manufacturing lathe).

Pratt & Whitney, Div. of Niles-Bement-Pond Co., Hartford, Conn. (model C lathe).

R. K. LeBlond Machine Tool Co., Cincinnati, Ohio (crankshaft lathe).

Wickes Brothers, Saginaw, Mich. (crankshaft lathe).

Metal Cutting Equipment

Manufactured by:

De Walt Products Corp., Lancaster, Pa. (semi-automatic metal cutting machine).

Linde Air Products Co., New York (shape cutter).

Tabor Mfg. Co., Philadelphia cut-off machine).

Milling Machines

Manufactured by:

Cincinnati Milling Machine Co.,

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YOUNG
RADIATORS—OIL COOLERS—HEAT EXCHANGERS
and HEAT TRANSFER PRODUCTS
Wherever heat transfer problems are found, Young Products will be closely associated. Radiators of cast tank sectional core construction for cooling gasoline or Diesel Engines ranging in size from the smallest type to units for cooling several thousand horsepower—oil coolers for the same engines either in combination with the jacket water radiators in the same frame or as separate units and using either water or air as the cooling medium—heat exchangers for cooling water, oil, air or gas—and intercoolers for cooling air between stages in two-stage air compressors are among the many varied heat transfer products manufactured by Young. Young Products are all thoroughly proven both in the laboratory and in the field. A competent staff of engineers is available to handle your problems and make suitable recommendations.
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L. O. Stratton, 817 - 17th Street
Denver, Colorado
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RACINE, WISCONSIN

Cincinnati, Ohio (No. 2MH milling machine).

Hardinge Brothers, Inc., Elmira, N. Y. (small parts milling machine).

Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn. (No. 3 universal bench miller).

Producto Machine Co., Bridgeport, Conn. (heavy-duty hand miller).

Sundstrand Machine Tool Co., Rockford, Ill. (process milling machine).

U. S. Tool Co., Inc., Ampere, N. J. (dual purpose milling machine).

Presses

Manufactured by:

Cleveland Punch & Shear Works Co., Cleveland, Ohio (inclinable press; 4-point suspension press).

E. W. Bliss Co., Toledo, Ohio (automatic press).

Farrel-Birmingham Co., Inc., Ansonia, Conn. (press for plastics and rubber moldings).

Hanna Engineering Works, Chicago (portable press).

Manley Products Corp., York, Pa. (hydraulic press).

Oilgear Co., Milwaukee, Wis. (300-ton speed press; 5-ton press; horn type press).

Trucks and Hoists

Manufactured by:

Automatic Transportation Co., Chicago (tiering trucks).

Baker-Raulang Co., Cleveland (lift trucks).

Cullen-Friestedt Co., Chicago (sheet steel lifter).

Elwell-Parker Co., Cleveland (industrial electric truck).

Harnischfeger Corp., Milwaukee, Wis. (electric hoist).

Lyon Iron Works, Greene, N. Y. (lift truck).

Miscellaneous New Developments

Manufactured by:

A. L. Hansen Mfg. Co., Chicago (automatic one-hand tacker).

Allis-Chalmers Mfg. Co., Milwaukee, Wis. (motor base).

American Car & Foundry Co., New York (forging heater).

American Foundry Equipment Co., Mishawaka, Ind. (heater; abrasive cleaner).

Athol Machine & Foundry Co., Athol, Mass. (milling machine vise).

Bakelite Corp., New York (resin).

Barnes Drill Co., Rockford, Ill. (honing machine).

Bethlehem Steel Co., Bethlehem, Pa. (floor plates).

Blatchford Corp., Chicago (micro-slotted nut).

Burgess Battery Co., Acoustics Div., Madison, Wis. (steel mill phone booth).

Cotta Transmission Corp., Rockford, Ill. (heavy duty transmission).

Delco-Remy Corp., Anderson, Ind. (starting switch for Diesel engines).

Detroit Rex Products Co., Detroit (degreasing machine).

DeVilbiss Co., Toledo, Ohio (spray gun; fluid strainer).

Divine Brothers Co., Utica, N. Y. (sheet buffer).

Duriron Co., Inc., Dayton, Ohio (heat exchanger).

In Mechanics Roller Bearing Universal Joints friction is reduced to the minimum. Then there is generous provision for lubricant. One "shot" reaches all four bearings on the cross equally, another fills the slip-yoke chamber. Highly efficient durable seals halt leakage of lubricant or entrance of dirt and water. These, and other outstanding advantages, are the reasons why Mechanics Universal Joints are used on leading passenger cars, trucks, and busses. Investigate. Write today for complete information.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner Corp. 1301 18th AVE., ROCKFORD, ILLINOIS

Eisler Engineering Co., Newark, N. J. (press type welder).

Fellows Gear Shaper Co., Springfield, Vt. (gear shaper; steering worm checker).

Firth Sterling Co., McKeesport, Pa. (brazing furnace).

Foote-Burt Co., Cleveland, Ohio (motor drive).

GM Laboratories, Inc., Chicago (photoelectric cells).

General Plastics, Inc., North Tonawanda, N. Y. (resins).

Gisholt Machine Co., Madison, Wis. (thread chasing attachment).

Hanna Engineering Works, Chicago (riveting machines).

Hannifin Mfg. Co., Chicago (packless valve).

Hoover Steel Ball Co., Ann Arbor, Mich. (ball bearings).

Independent Pneumatic Tool Co., Chicago (electric sander).

Ingersoll Milling Machine Co., Rockford, Ill. (cemented carbide cutters; face mill cutter).

Kane & Roach, Inc., Syracuse, N. Y. (rotary straightening mill; equipment for radiator manufacturers).

Kelly Reamer Co., Cleveland, O., serrated blade cutting tools.

Keystone Reamer & Tool Co., Millersburg, Pa. (reaming, honing, burnishing machine).

Landis Machine Co., Waynesboro, Pa. (collapsible taps).

Lincoln Electric Co., Cleveland, Ohio (arc welder).

Lindberg Engineering Co., Chicago (pot furnace).

Link-Belt Co., Philadelphia (worm gear speed reducer).

Madison-Kipp Corp., Madison, Wis. (die caster).

Michigan Tool Co., Detroit (gear shaving machine; gear speeder).

National Acme Co., Cleveland (automatic chucking machine).

National Broach & Machine Co., Detroit (gear finisher).

Niagara Machine & Tool Works, Buffalo, N. Y. (power shears).

Reed-Prentice Corp., Worcester, Mass. (spindle nose).

Reeves Pulley Co., Columbus, Ind. (variable speed drive).

Rivett Lathe & Grinder, Inc., Boston, Mass. (lubricating equipment).

Rockford Machine Tool Co., Rockford, Ill. (planer).

Schramm, Inc., West Chester, Pa. (compressor).

Self-Vulcanizing Rubber Co., Inc., Chicago (improved plastic rubber products).

Seneca Falls Machine Co., Seneca Falls, N. Y. (work handling device for lathe).

SKF Industries, Philadelphia (pillow block).

Skinner Purifiers, Inc., Detroit (filter for fuel oil).

Spicer Mfg. Co., Toledo, Ohio (power take-off).

Stoker Unit Corp., Milwaukee, Wis. (boring machine).

Sundstrand Machine Tool Co., Rockford, Ill. (hydraulic pump for machine feeds).

Tomkins-Johnson Co., Jackson, Mich. (remote control valve system; riveting machine).

Tungsten Carbide Tool Co., Detroit (carbide tipped lathe centers).

Universal Gear Corp., Indianapolis, Ind. (variable speed drive).

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. (cross field generator for welder; enclosed d.c. motor).

THOSE HIDDEN COSTS...NOW ARE
PROFITS!
The correct oil film to each individual bearing... automatically
BIJUR
AUTOMATICALLY Correct LUBRICATION
BLISS Power Press
● Remember them? Oiling time lost from productive work . . . Lubricant wasted . . . Production delays . . . Increased depreciation.
● How those hidden costs gnawed at profits! Money that now is clear . . . simply by the convenient, economical use of BIJUR lubricated machines. Clean lubricant is pumped and fed automatically . . . to each bearing the correct oil film it individually requires. No lubrication troubles . . . even to think about!
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707

Dealers Improve Their Profit Position

(Continued from page 605)

have made considerable progress during the past year. They have gained numerous concessions which have helped to increase their profit possibilities. It is gratifying to state that many of the leading manufacturers are showing greater interest in dealer conditions. They have made a real effort to work more closely with the dealer organizations and assist them. More liberal policies have been inaugurated and a sincere attempt has been made to help dealers develop better merchandising methods in all departments of their business.

This has been particularly true in the field of used motor vehicles. The importance of the used motor vehicle as an integral part of the new car sale and its influence on the continued sale of new motor vehicles in volume is receiving closer attention from the manufacturers in the development of their advertising and selling programs.

Several manufacturers have established efficient used motor vehicle merchandising departments to assist their dealers in accelerating the rate of turnover of used car stocks. The importance of reconditioning used cars so that they can be sold with a reasonable guarantee is being emphasized more and more. Through newspapers, magazines, bill boards and radio, advertising has been used to impress upon the millions of individuals who buy used motor vehicles the desirability of this merchandise as economical transportation. We cannot overestimate the value of this cooperative activity, not only in furthering the sale of new motor vehicles, but in building confidence and public prestige for automobile dealers who, in the very nature of things, are required to accept in trade, recondition and sell millions of used cars every year.

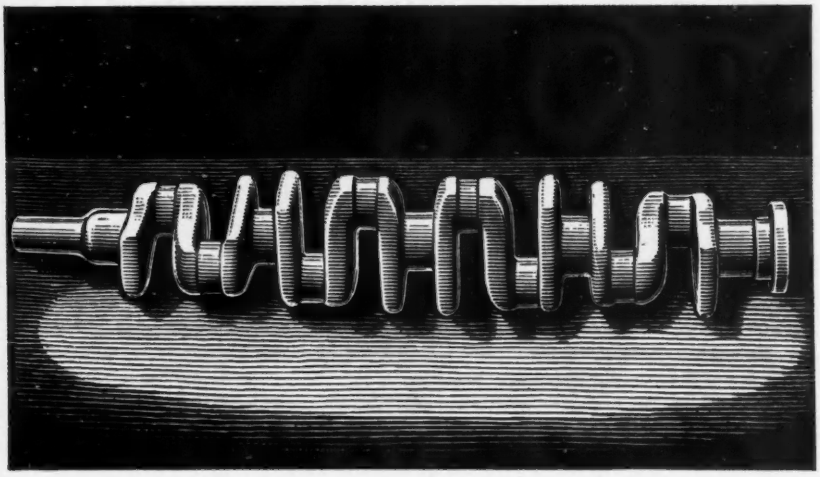
While much time, effort and money have been expended to help stimulate the sale of used motor vehicles, it is the opinion of many dealers that these difficulties experienced in used car operations will only be overcome when similar effort is directed toward teaching automobile dealers and their sales organizations sound and proper methods of selling the appraisal or trade-in allowance to the new car buyer. It is unfortunately true that the heavy losses in used car department operations of automobile dealers are due, in large part, to the fact that dealers pay more for used cars than they can realize from their sale. A gross loss in used car operations is the rule for most dealers, whereas good management indicates that a gross profit is not only reasonable but a necessity.

Market Primarily for Replacement

The automobile market is still primarily one of replacement. Although the number of new automobiles sold involving no trade-ins has increased considerably, it is still generally true that the automobile dealer must handle and sell approximately two used automobiles for every new one sold.

Perhaps the most difficult situation with which dealers have had to contend this past year has been that resulting from the lack of territory protection. The mobility of the automobile; the ease with which both buyer and seller can contact each other over wide areas; the intense competition, not alone between various makes, but particularly between dealers handling the same make car, all contribute to make the open territory policies a source of dissatisfaction. It is the opinion of many representative dealers that correction of this condition would do much to remove the major obstacles that stand in the way of dealer stability and progress.

Bootlegging of new automobiles through curbstone operators who do



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with a background-

Behind every Wyman-Gordon forging stands diligent scientific examination of every bar of steel —continuous laboratory control of all processes.

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THE CRANKSHAFT MAKERS
Worcester, Mass. - Harvey, Ill. - Detroit, Mich.

not hold dealer franchise has likewise presented an acute situation in many sections. Public interest requires that the industry make every effort to stop the sale of automobiles except through legitimate and properly directed channels of distribution.

Manufacturers are not unaware of these conditions and recent statements by certain of the major manufacturers, as reported in the trade press, indicates that this entire subject is receiving careful consideration and that an effort is being made to provide adequate remedies. There should be a decided improvement in respect to these conditions during the coming year.

Dealer Interest in Legislation

Automobile dealer groups have taken considerable interest in legislation during the past year. In several states they have been successful in getting legislation designed to benefit the trade. Possibly the outstanding piece of legislation was that passed in Wisconsin, known as the Licensing Law. This law licenses dealers, salesmen and finance companies and established rigid regulations for the automobile business. Conceded to be experimental, the operation of this particular piece of legislation will be watched closely. If it works out successfully, it is likely that similar legislation will be sought in other states.

The efforts of local, state and the national association of automobile dealers during the past year have been largely directed toward combatting the increasing burden of taxation shouldered by the automobile industry. Reduction of these taxes will, it is believed, result in stimulating the sale of automotive products which, in turn, will permit the employment of thousands of additional workers in the various departments of the industry.

Progress has been made in bringing about a better understanding of the inter-dependence of the manufacturing, distributive and financing branches of the industry. This industry cannot permanently suceeed unless all those who are a part of it participate in the benefits and possess equal opportunity to profit therefrom.

Through the medium of nation-wide trade surveys, data pertaining to the actual experience of automobile dealers has been gathered, compiled and distributed to the trade. This fact-finding activity is designed to acquaint automobile dealers with the conditions which exist in motor vehicle retailing and to point out those elements which are detrimental to the best interests of the industry and which should be corrected. The importance of management and the responsibility of the individual dealer in properly planning and controlling his business operations is being stressed. As a result of these surveys, the elements which are largely responsible for unsatisfactory operations are now better understood throughout the industry.

Despite the fact that automobile dealers have contributed materially in the re-employment of thousands of workers at good wages, and that working conditions generally are above the average, the past year has witnessed sporadic labor disturbances in various parts of the country. This has been confined largely to automobile mechanics in dealer service departments. Fortunately, most of these misunderstandings have been settled amicably and on a basis which should prevent their recurrence.

Surveying the operations of automobile dealers and the general picture throughout the industry, the year 1936 has been one of marked progress in all departments. As is to be expected in a group of this magnitude, there will undoubtedly be a considerable number of dealers who, through unbusinesslike operations, or through conditions beyond their control, will show losses. The majority, however, will, if present conditions continue, end the year in

THE SOLID SHIM THAT P-E-E-L-S FOR ADJUSTMENT
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THE SAME LAMINUM SHIM that saves precision machining, fitting, and factory assembly costs, gives users an easy, accurate service adjustment feature for the life of the equipment.
YOU SIMPLY PEEL your adjustments . . . one or more laminations at a time . . . from the solid laminated shim! Write for a sample of LAMINUM . . . either .002 or .003" laminations.
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CLEVELAND DETROIT MILWAUKEE

much better shape than 1935, due to the larger new car sales volume and a noticeable increase in service, parts and accessory sales. A minority group of superior operators will check off the year 1936 as one in which they were able to earn very satisfactory profits.

Public Confidence

(Continued from page 613)

shows in different cities—The new Terraplane is advertised in 2000 papers—Chrysler says advertisements should be human in form and wording so they will be read—Buick carries out an intensive one month campaign, spending "$1,000,000 on twelve words."

1933

How advertising has changed the positions of the leading contenders for sales in the last two years—General Motors writes a letter to stockholders who sell their stock—"Has Style gone too far?" an editorial in *Printers' Ink*—Competitive advertising battles begin in earnest—Ford advertises in every city where there is a dealer—*Printers' Ink* assails "back fence" advertising, claiming it does more harm than good and makes public distrust the product as a result of the competitive claims—Hudson urges copy be "friendly"—the Ford-Chevrolet fight still rages—General Motors begins to stress its "Proving Ground of Public Opinion"—Plymouth and Chevrolet fight each other locally—Ford to have "biggest" campaign—Pierce Arrow uses different types of copy for the various classes of prospects.

1934

Picture book of mechanical developments in non-technical language for the layman—A Ford dealer advertises that bank robbers used a Ford—The industry seeks to show clearly how its two newest features, "knees" and streamlining, work—Nash enters the national advertising field for its Lafayette series—Motor vehicle administrators urge the industry to omit speed advertising*— General Motors goes ahead with its consumer survey of what is wanted in cars—Ford holds down the amount of commercial advertising in its World's Series broadcasts—Chrysler again goes out to win children's support by developing miniature pushmobile Airflows—Dodge tries a new advertising line, claiming less "fatigue" in using its cars—Chevrolet recognizes public objection to price extras and orders dealers to quote delivered prices.

1935

Governor-elect Hoffman of New Jersey urges auto advertising to stress safety—Ford, desiring farm support, advertises the amount of farm products used in the car—Chevrolet is praised for its "Safety" advertisements—full fanfare of publicity for the first fall show—Chevrolet seeks the oldest car constantly used by same owner and still used—Ford hooks up 10,000 dealers by telephone for a sales conference, and plans a big campaign—Buick gets Warner Brothers Pictures to agree to use Buicks in auto shots—Chrysler return to personal idea in advertising, featuring photos of company executives.

1936

The General Motors Parade of Progress Caravan starts a long tour—Hudson localizes its advertising copy—Owner of the oldest Chevrolet refuses to part with the car—Advertising gains in volume—Studebaker publicly says to veterans "Keep your Bonds"—Pontiac aids men on changeover layoff by advancing them future pay—advertising for 1937 to be the "biggest."

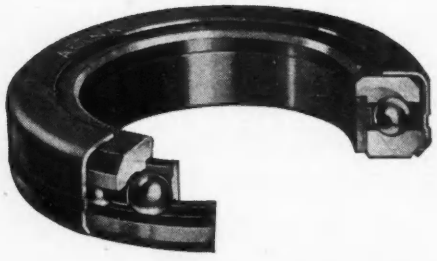
*(Editor's Note: The Automobile Manufacturers Association only very recently in 1936 has agreed to avoid referring to top speeds in advertising.)

Motordom's standardization of Aetna "T" Type Clutch Release Bearings is due not alone to the unique features which permanently abolish eccentric thrust, permit lubrication "for life" and eliminate escape of lubricant to clutch facings but also because every part, every feature of these fine bearings, conforms to one standard — utmost quality.

This uncompromising attitude towards quality is a factory-wide law enforced by 44 different tests and inspections and obviously every bearing that "runs this relentless gauntlet" must possess the very highest standards of excellence.

With their quality thus assured and in addition, pre-proven by time and millions of miles of punishment on the nation's proving grounds, there remains little doubt of their ability to "take it." If you aren't using them, write for complete engineering data.

1. First of the 44 tests, this amazing camera reveals the slightest imperfection in steel structure.
2. Unique Light Gauge, accurate to 5/100,000th of an inch.
3. This sensitive electrical ear detects measures and rejects every bearing that isn't noiseless and vibration-free.
4. Cold, heat and endurance break down tests pre-prove stamina under all conditions.



AETNA BALL BEARING MANUFACTURING CO.

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